Liebert® AFC

Air-Cooled chiller and Freecooling chiller with Screw Compressors

User Manual

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This document, written in English, is the original version

SAVE THESE INSTRUCTIONS

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Documents supplied with the machine

- User Manual (this document)
- Vertiv™ iCOM3™ User Manual
- Electric Diagrams
- Refrigerant and Hydraulic Diagrams
- CE – PED declaration of conformity
- Instruction Leaflet for Transport and Handling (on the packaging)
- Warranty Certificate

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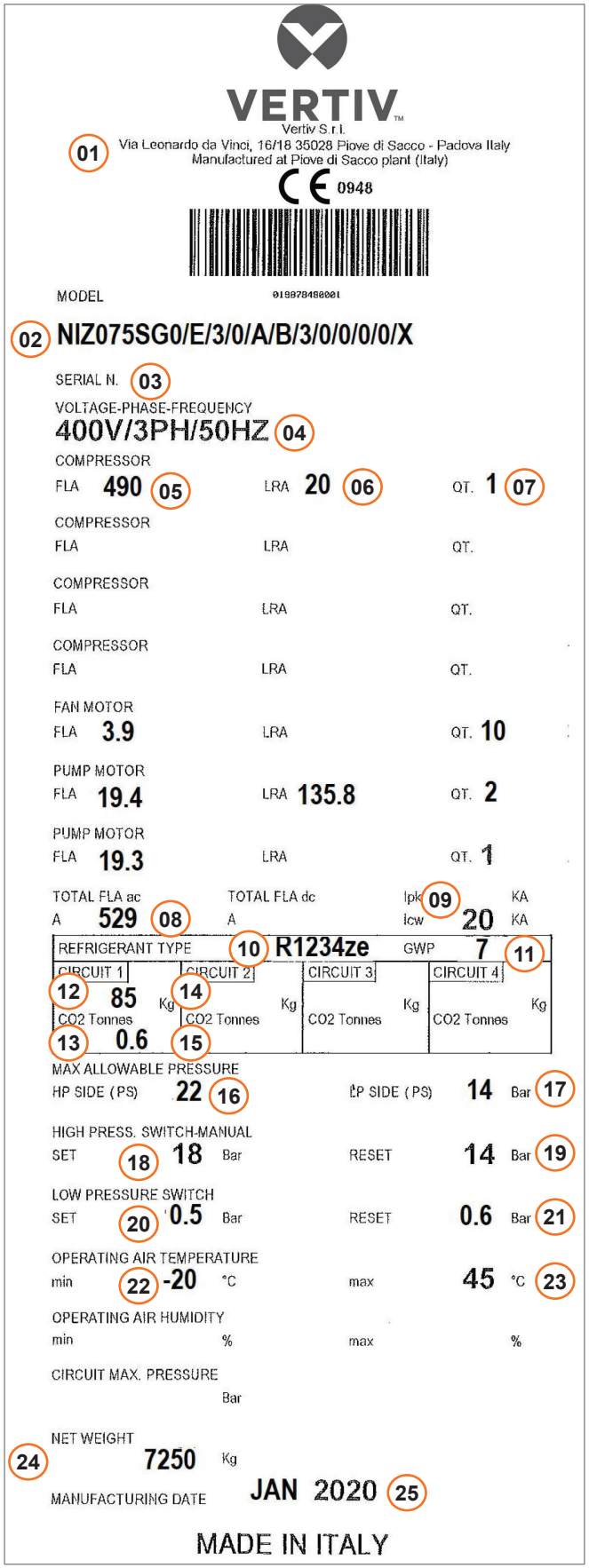


Onboard Label

Please refer to the label placed on the unit for the relevant operating data.

If you need assistance or spare parts, please find the model identification and the serial number on the label.

NOTICE

The data in the manual are referred to standard conditions and can be modified without any advance notice.

The data relevant to the supplied unit are filled in the inboard label (see on the left a facsimile).

Pos.	Description
01	Manufacturing plant
02	Model
03	Serial number
04	Power input
05	Circuit 1 - Compressor Full Load Ampere
06	Circuit 1 - Compressor Locked Rotor Ampere
07	Circuit 1 - Compressor quantity
08	Unit Total Full Load Ampere AC [A]
09	Rated Short-Time Current [kA]
10	Refrigerant type
11	Refrigerant GWP
12	Circuit 1 - Refrigerant charge on factory
13	Circuit 1 - Refrigerant charge CO_2 tonnes
14	Circuit 2 - Refrigerant charge on factory
15	Circuit 2 - Refrigerant charge CO_2 tonnes
16	Max allowable pressure - High pressure side
17	Max allowable pressure - Low pressure side
18	High pressure switch - Stop
19	High pressure switch - Restart
20	Low pressure switch - Stop
21	Low pressure switch - Restart
22	Min. room operation temperature
23	Max. room operation temperature
24	Net weight
25	Manufacturing date

1. Safety

This chapter gives general safety instructions.

Additional safety warnings, for specific operations, are given in the rest of the manual.

1.1 Conventions

DANGER - Indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING - Indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION - Indicates a hazardous situation which, if not avoided, **may** result in minor or moderate injury.

NOTICE

Indicates a property damage message.

ENVIRONMENT

Indicates a environment damage message.

WARNING

Low Burning velocity gas.

1.2 General Instructions

Intended readers	This User Manual is intended for transport, installation and maintenance personnel. The end user can only switch the unit **ON** and **OFF** (see *5.5.1 Electric box and main switch*).
Authorized personnel	The operations described in this manual must be made by technical staff, expressly authorized in compliance with the regulations in force at the installation site.
Read this manual	Carefully read the manual before performing any operation on the unit.
Keep this manual	Keep the manual during the complete life-span of the unit. Keep the diagrams provided with the unit (wiring, refrigerating circuit,...). They are part of the instructions for use. If you move or sell the unit, transfer the manual and the diagrams together with the unit. This manual may be subject to modification. For complete and up-to-date information always consult the manual supplied with the machine.
Intended use	Exclusively employ the unit for the purpose it has been designed (see *3. Intended Use*). The improper use of the unit exonerates the manufacturer of any responsibility.
Do not modify the unit	Do not modify the unit in any way, including the control system and the software. Any modification to the unit exonerates the manufacturer of any responsibility.
Warning labels	Pay attention to the warning labels on the unit. See *Annex III - Safety Labels* for the mapping of the safety labels placed on the unit.

1.3 Electric System

WARNING

Unit contains potentially lethal voltage in some circuits. If the electrical panel is open, the socket and the light could remain supplied.

Risk of arc flash and electric shock.
Can cause injury or death.

- Open all local and remote unit electric power disconnect switches, verify with a voltmeter that power is **OFF** and wear protective equipment per local standard before working within the electric control enclosure.
- The panel key supplied with the unit must be kept by the person responsible for maintenance.

WARNING

The electric and control enclosures can retain a stored high-voltage electrical charge for up to **10** minutes.

Risk of electric shock.
Can cause serious injury or death.

Before working within the unit electric and control enclosures proceed as follows:

- open all local and remote unit electric power disconnect switches
- wait **10** minutes
- verify with a voltmeter that power is **OFF**

Only properly trained and qualified personnel may perform repair, maintenance and cleaning.

WARNING

If the electrical panel is open, the socket and the light could remain supplied.

1.4 Personal Protective Equipment

As a general rule, always wear the following **PPE** (Personal Protective Equipment):

Ensure that all required safety measures are followed such as: wearing protective clothing (shoes, gloves and safety glasses using appropriate tools, employing qualified and skilled technicians (electricians, refrigeration engineers) trained in the use of flammable refrigerants and following local regulations (see Annex E in EN 378-4-Guidelines for repairs of equipment using flammable refrigerants A2L).

CAUTION

Components at high temperature (discharge line and compressor at about 90°C).
Always wear temperature resistant gloves when operating on the unit.

2. Digit Nomenclature

The unit is fully defined by twenty-five (25) digits.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
C	H	4	0	6	5																			

Digit	Feature	Value	Description
1	Versions	C	Chiller
		F	Free cooling
		N	Free cooling - Glycol free
2	Compressor type	H	Screw
		I	Inverter screw
3	Refrigerant	4	R134a
		Z	R1234ze
		3	R513A
4-6	Size	XXX	Cooling capacity / 10 kW
7	Water Regime	S	Standard delta T
		H	High delta T
8	Efficency	G	High Efficiency
9	Power supply	0	400V/50Hz
10	Fans and Acoustics	C	EC fans / Base
		E	EC Fans / Premium
		L	Low noise
		Q	Quiet
11	Pumps	0	None
		1	Single standard head pump + Hydraulic kit
		2	Single high head pump + Hydraulic kit
		3	Double standard head pump + Hydraulic kit
		4	Double high head pump + Hydraulic kit
		5	Single inverter pump + Hydraulic kit + Flow meter
		6	Double inverter pump + Hydraulic kit + Flow meter
		7	Hydraulic kit
		A	Variable flow - 1 inverter pump + H.K. + Flow meter
		B	Variable flow - 2 inverter pump + H.K. + Flow meter
		C	Variable flow - NO pumps + H.K. + Flow meter
12	Adiabatic System	0	None
		1	Premium Adiabatic Pad System/ direct flow

Digit	Feature	Value	Description
12	Adiabatic System	2	Premium AD Pad System / with recirculation
		Z	Predisposition for Premium Adiabatic Pad System
13	Coil options	0	Microchannel Condenser
		1	Microchannel Condenser / Base coating
		2	Microchannel Condenser / Premium Coating
		A	Microchannel Condenser + Microchannel FC Coil
		B	Microchannel Condenser + Microchannel FC Coil / Base Coating
		C	Microchannel Condenser + Microchannel FC Coil / Premium Coating
		D	Microchannel Condenser + Finned FC coil
		E	Microchannel Condenser + Finned FC coil / Base Coating
		F	Microchannel Condenser + Finned FC coil / Premium Coating
14	Display	A	Small graphic display with monitoring
		B	Large touch display with monitoring
15	Refrigerant circuit options	0	None
		1	Suction shut-off valve on compressors
		2	Dual Relief valve and changeover valve
		3	Suction shut-off valve on compressors + Dual Relief valve
		4	Plumbed shut-off valve for refrigerant safety valve
		5	Suction shut-off valve on compressors + Plumbed shut-off valve
16	Low / High Ambient temperature	0	None
		1	Heater for electrical panel
		2	Heater for electrical panel + Trace heaters
17	Power supply line option	0	Single line (main line)
		1	Single line (main line) + Ultracap for control
		2	Double line: main line + second line for control
		3	Double line: main line + second line for control + Ultracap
		A	ATS on main line
		B	ATS on main line + Ultracap for control
		C	ATS on main line + second line for control
		D	ATS on main line + second line for control + Ultracap
18	Condensing coil filter / Protection grid	0	None
		1	Condensing coil filters
		2	Protection grid
		3	Condensing coil filters + protection grid
19	Packing	0	Standard
		1	Seaworthy + skid for flat rack
		2	Wooden box + Seaworthy
		3	Wooden Cage + Seaworthy
25	Special Request	0	None
		X	As specified

3. Intended Use

The **Liebert® AFC** units have been designed and manufactured for production of chilled water.

They are made of two refrigerating circuits, each one with a screw-compressor, an air-cooled condenser and a shell & tube evaporator.

The tube evaporators of both the circuits are coupled in the same heat-exchanger where the water is chilled.

The **Liebert® AFC** units are factory assembled and pre-charged. All the internal wiring is factory completed. Only electrical and water connections must be made at the installation site.

See chapter *5. Description* for details about the unit's structure, versions and optional components.

3.1 Functional Limits

Refrigerant

This unit is designed for use with R134a/R513A/R1234ze (all group 2, not dangerous according to PED Directive).

According ASTM E681-04 @ 21ºC R1234ze is not flammable, so the Safety Data Sheet of this refrigerant says that is not flammable with no issue for stock or transport for the refrigerant cylinders; for the unit see dedicated chapter.

According to ISO-819, R134a and R513A are classified in safety group A1, instead R1234ze(E) is classified in safety group A2L: lower flammability.

One of the characteristics of this refrigerant (R1234ze) is the absence of flammable mixture with air under 21°C of ambiance and controlled humidity conditions; however when humidity or temperature goes up, this refrigerant can become flammable and can represent a potential danger if flammability risks are not properly mitigated.

WARNING

Risk of components failure or breakage.
Do not use other refrigerants.
Contact the manufacturer in case of doubt.

Electrical system requirements

Voltage: 400 V - 3 phase - 50 Hz.

WARNING

Risk of components failure or breakage.
Do not use different voltage.
Contact the manufacturer in case of doubt.

Performance

See chapter *6. Technical Data and Performances.*

3.2 Operating Environment

This unit is designed for outdoor installation, with the following ambient conditions:

Ambient temperature

The units are designed to operate in:

Minimum temperatures:

-25°C for freecooling models;

-20°C for all N** glycol free units;

-20°C for all units with inverter pump;

-10°C for only chiller models;

Maximum temperatures:

depending on the model as indicated in the *6.3 Operating Limits*.

Max altitude

< 2000 mt

Ambient conditions

Outdoors; see *8.3 Installation site* for A2L restrictions.
Do not use in explosive, acid or anyway aggressive atmosphere.
Relative humidity is up to 50% at temperature of +40°C

Storage Conditions	Temperature +0°C ─ +45°C, ask your Vertiv™ representative for T < 0°C. **Humidity:** 5 ─ 80% non-condensing; See *7.3 Storage* for A2L restrictions.

3.3 Space Limits

Overall unit dimensions	Provide enough free space to place the unit. See *Annex I _ Dimensions and Weights.*
Clearance	Keep a free space around the unit as explained in chapter *8.3.3 Space Requirements*.

4. Reference Norms

The **Liebert® AFC** units are designed and manufactured in accordance with the following European Directives:

EU Directives	- Machine Directive 2006/42/CE; - PED Directive 2014/68/EU; - Low Voltage Directive 2014/35/UE; - EMC Directive 2014/30/UE; - RoHS II Directive 2011/65/EU; - RoHS III Directive EU/2015/863;

The **Liebert® AFC** units are designed, manufactured, and tested in full or partial accordance with the following Standards:

Performance test norms	- Cooling Capacity according to EN 14511; - Sound Power Level according to ISO 3744;
CE Marking and Declaration of Conformity	The units are marked "**CE**". Each unit is supplied complete with individual test certificate in accordance with internal procedures and a Declaration of Conformity to the relevant European Union Directives.
UKCA Marking and Declaration of Conformity	The units are marked "**UKCA**". Each unit is supplied complete with individual test certificate in accordance with internal procedures and a Declaration of Conformity to the relevant UK Safety Regulations.

5. Description

Liebert® AFC air-cooled chillers have been designed for the production of chilled water.

They are also produced in versions with built-in freecooling or freecooling glycol free device and with pump group mounted on the machine; the chiller units can be completed with numerous accessories included in the price list.

The **Liebert® AFC** line is designed according to the most advanced techniques available in the industry today and is complete with all the elements necessary for automatic and efficient operation. Each unit is completely assembled in the factory; after the vacuum, it is charged with the necessary quantity of refrigerant and tested.

All units are equipped with one or two independent refrigerant circuits, each consisting of: air-cooled condenser, semi-hermetic screw compressor (with or without inverter regulation), shell and tube evaporator and pipes. The components of the refrigerant circuit present in the liquid line are the filling valves, the dehydrating filters, the shut-off valve, the humidity indicator light and the electronic expansion valve; on the compressor there is always the tap on the delivery line while it is optional on the suction line.

The hydraulic circuit consists of grooved hydraulic pipes connected by joints (Grooved pipes connections), status flow and, in the freecooling versions, by chilled water batteries and two two-way valves; in the freecooling glycol-free versions an intermediate plate exchanger separates the heat exchange between the air exchangers, where glycol is present, and the hydraulic circuit of the evaporator where there is chilled water from the user circuit; suitable heating elements prevent the water from freezing in the hydraulic circuit of the evaporator.

The semi-hermetic screw compressors are complete with the following protection / safety devices: oil heater, internal safety valve, oil level (optional), electronic protection with function for controlling the temperature of the motor windings, the oil temperature and the sense of screw rotation.

In the versions with screw compressors with integrated inverter, the operating stability and operating efficiency of the chiller is further improved thanks to the continuous speed control of the compressor itself and the optimized management of the Vi compression ratio (thanks to an automatic internal valve); in addition to cooling the inverter itself, the compressor also manages and monitors safety functions with integrated sensors such as high pressure, low pressure, engine temperature, temperature and oil level (optional) alarms, operating conditions close to the application limits allowed.

For the operation of the inverter compressor, a line reactor is mounted on the electrical panel; this device is indispensable and provides for reducing the harmonics transmitted by the inverter to the power supply network.

Liebert® AFC water chillers are controlled by the Vertiv™ iCOM3™ microprocessor which manages all the operating conditions of the units. The user can vary and / or modify the operating parameters via the display keyboard installed on the electrical panel.

The electrical control panel is equipped with all the necessary safety and operating devices to ensure reliable operation.

The compressor motors are equipped with protections on all three phases and are started by three-pole contactors.

The refrigerant R1234ze falls into refrigerant safety group A2L in accordance to ISO-5149 and to EN-378 instead R134a and R513A are A1.

The **Liebert® AFC** liquid chillers are classified as “indirect vented closed system” (according ISO-5149 and EN-378) and are designated to be installed in a location class III (open air) with occupancy access category Class C (as per ISO-5149 and EN-378) where only authorized personnel have access; with these limits for both A1 and A2L refrigerant gas there aren’t any charge restriction. This limitation must be managed by the customer.

Please refer to these standards for further details. This level needs to be confirmed by the customer.

5.1 Versions

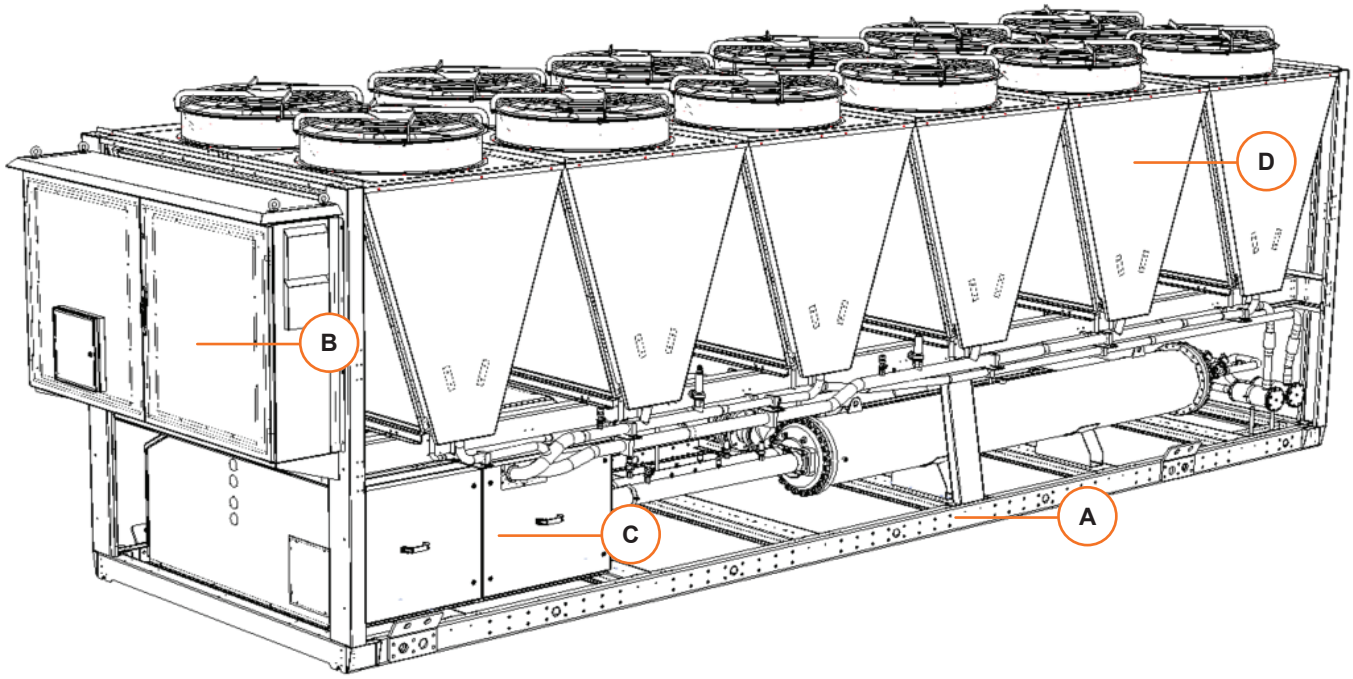
The **Liebert® AFC** units are available in the following versions:

Feature	Standard version	Optional version
Hydraulic Circuit	Chiller	Chiller with pump(s) with standard head, high head or inverter
	Freecooling chiller	Freecooling chiller with pump(s) with standard head, high head or inverter
	Freecooling glycol-free chiller	Freecooling glycol-free chiller with pump(s) with standard head, high head or inverter
Refrigerants, compressor(s) and refrigerant circuit(s)	R134a with standard screw compressors always double circuits	R513A with standard screw compressors always double circuits
	R1234ze with inverter screw compressor single and double circuits	

Feature	Standard version	Optional version
Noise	Standard version with EC fans base and premium, with standard noise insulation material on compressor box	Low Noise (**LN**) version with LN fans and standard noise insulation material on compressor box
		Quiet (**Q**) version with low speed LN fans advanced sound insulation material on compressor box and all around the most relevant noise sources

5.2 Structure

5.2.1 Standard version Chiller



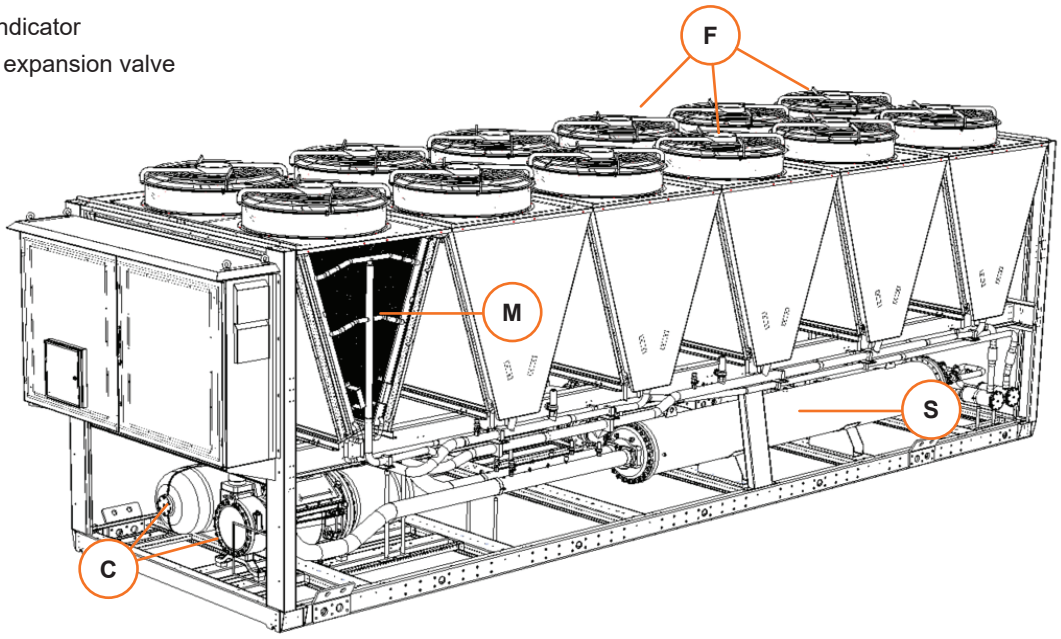
A	Supporting structure
B	Electric panel
C	Compressors box
D	Coils/fans “**V**” block

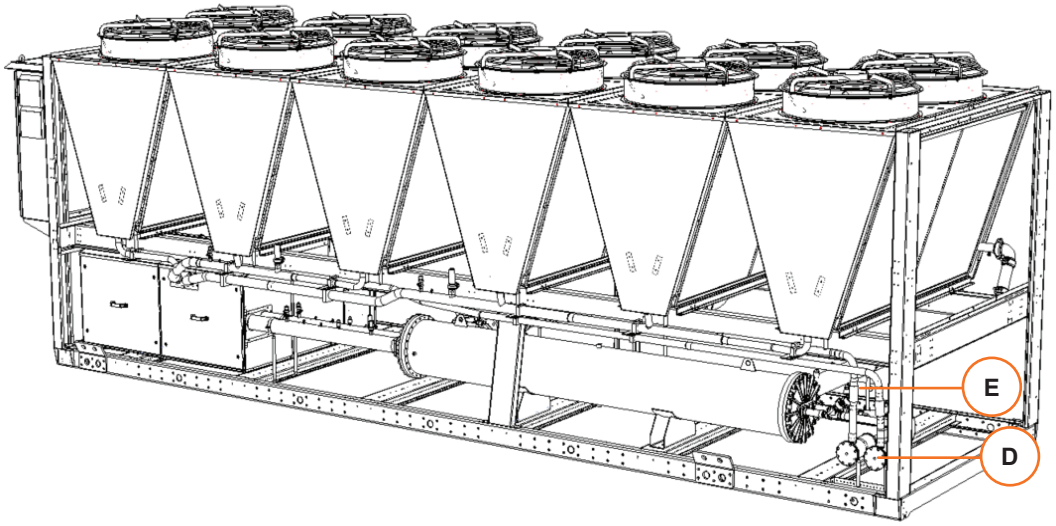
5.3 Refrigerating System

5.3.1 Main components

The unit is equipped with one or two independent refrigerating circuits, composed of an air-cooled condenser, a semi-hermetic screw compressor, a shell-tube evaporator. The evaporator tube of one or both the circuits are coupled in the same shell heat-exchanger. The chilled water flows through the shell side. A shut-off valve is installed on the discharge of the compressor. See *Annex II - Refrigerating Circuit* for details. The components of the liquid line are:

- Charging valves
- Filter-dryers
- Moisture indicator
- Electronic expansion valve



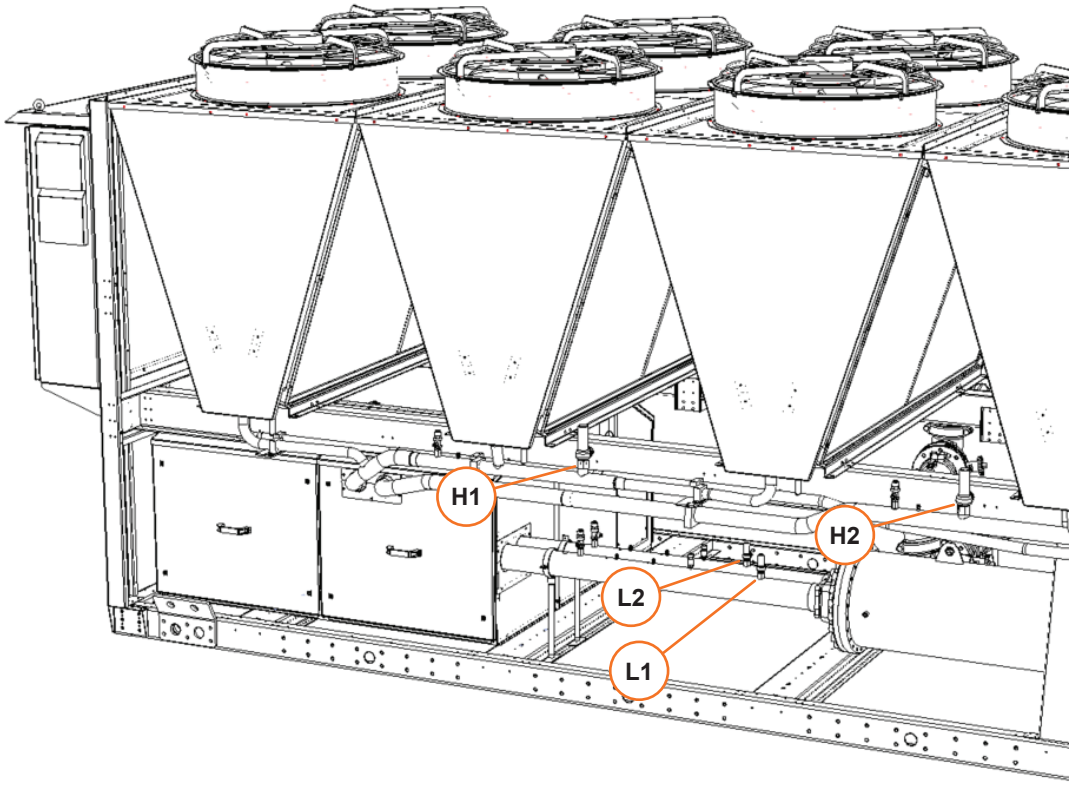


C	Semi-hermetic screw compressors
D	Filters-driers
E	Expansion valves
F	Fans
M	Microchannel condensers
S	Shell tube evaporator

5.3.2 Safety devices

Each refrigerating circuit is provided with the following safety devices:

Safety valves



H1	High pressure safety valve(s) circuit #1
H2	High pressure safety valve(s) circuit #2
L1	Low pressure safety valve(s) circuit #1
L2	Low pressure safety valve(s) circuit #2

See chapter *6.3 Operating Limits* for details.
See also chapter *10.8 Calibrations* for maintenance and calibration operations.

WARNING

Make sure that the safety valves are always free to discharge.
Do not cover the safety valves.
For units with A2L refrigerant please follow safety valve connection guide.

NOTICE

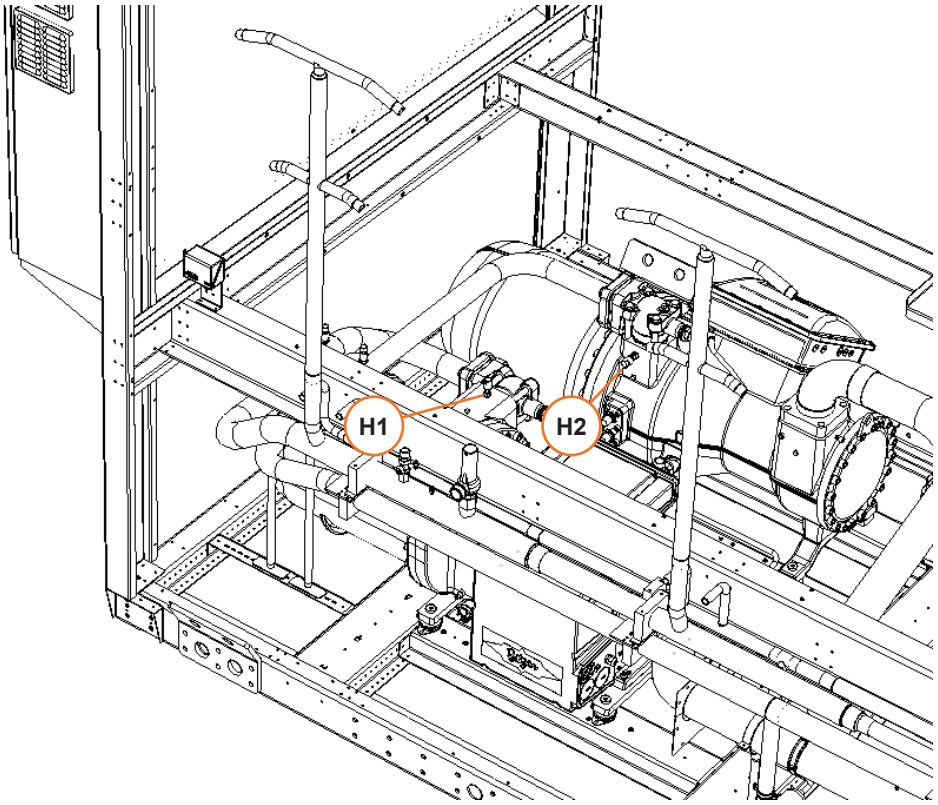
The operation, servicing and maintenance of pressure equipment and pressure assemblies are regulated in compliance with national regulations of Member States of European Communities.
The shut-off valves, installed between vessel and safety valve, allow removing the valve for periodic checking or replacement without blowing off all the refrigerant from a section of the system.
The safety valves are installed in open position and the ball spindle is protected by means of a cap screwed to the body and sealed with lead to it.

Any closing intervention on the valve forcedly causes the tampering of the seal and then these interventions shall be performed exclusively by:

- Staff authorized to work on the system;
- Public servant of a Competent Body;

These persons will be responsible for the next valve reopening and the new cap sealing with their own lead.

High pressure switches

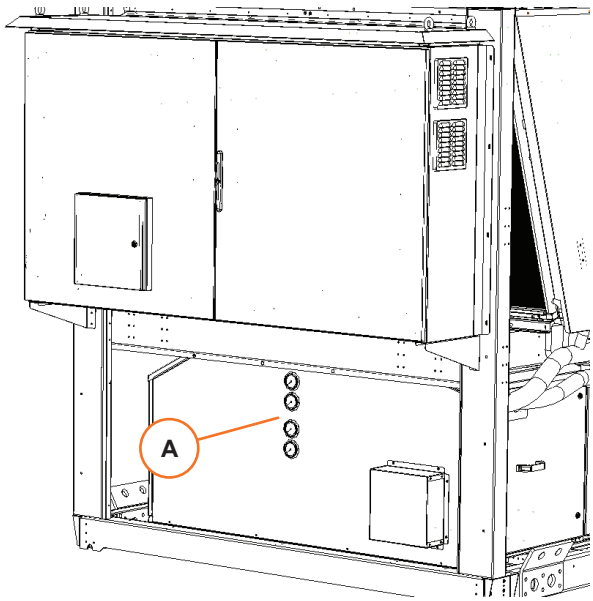


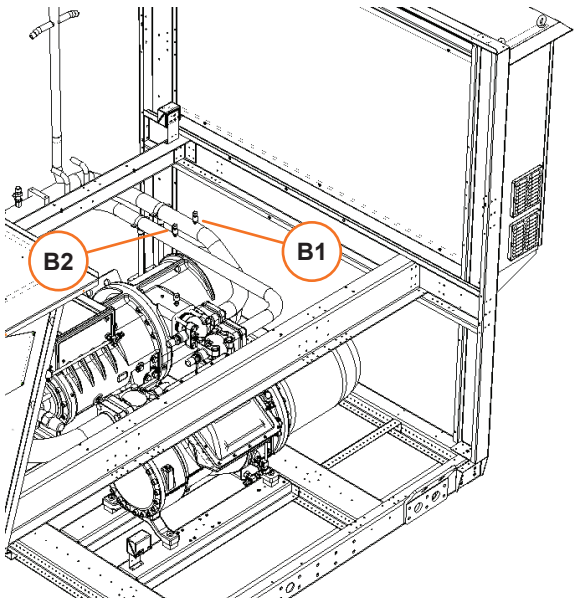
H1	High pressure switch circuit #1
H2	High pressure switch circuit #2

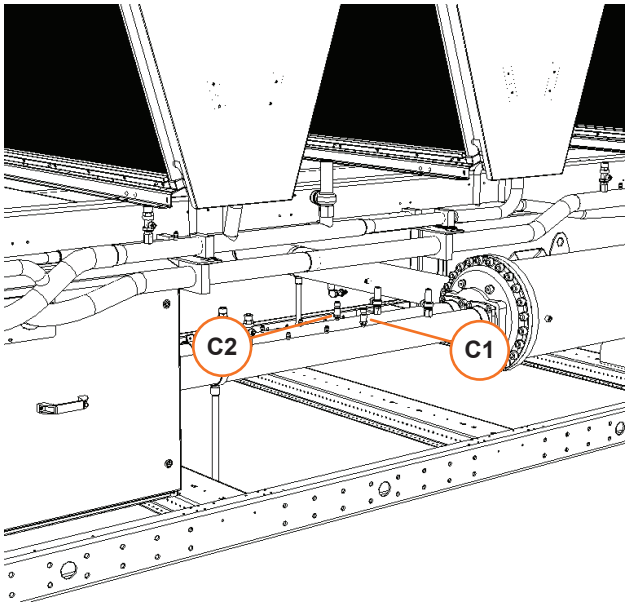
See chapter *6.3 Operating Limits* for details.

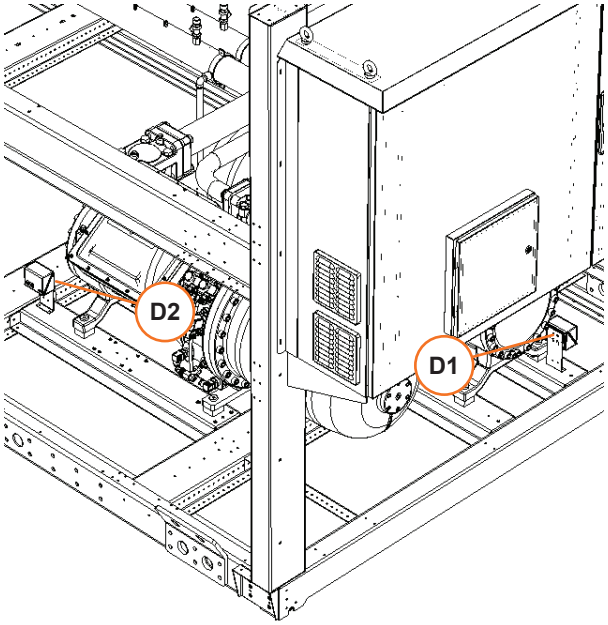
5.3.3 Sensors and instruments

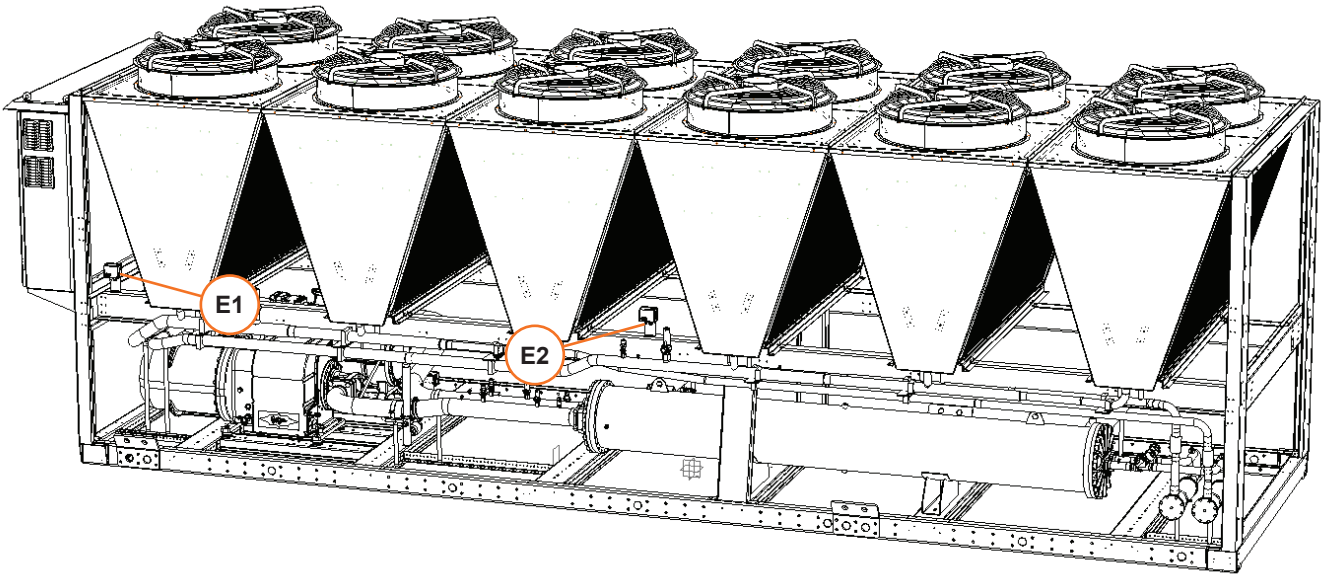
Each refrigerating circuit is provided with the following sensors and instruments:





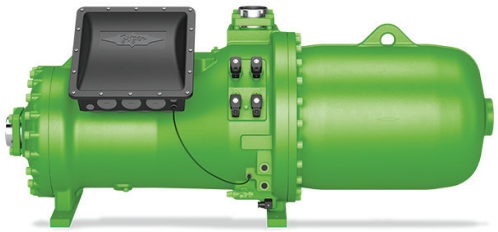






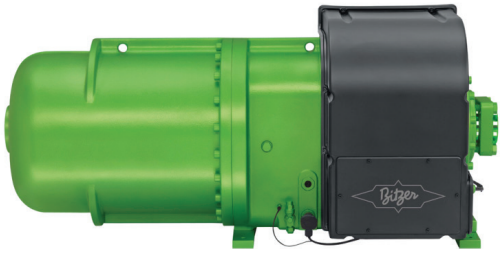
A	Refrigerant gauges
B1	Pressure transducer High pressure Circuit 1
B2	Pressure transducer High pressure Circuit 2
C1	Pressure transducer Low pressure Circuit 1
C2	Pressure transducer Low pressure Circuit 2
D1	Low pressure switch circuit 1 (only for model with suction valve)
D2	Low pressure switch circuit 2 (only for model with suction valve)
E1	Low pressure switch circuit 1 (only for R1234ze model)
E2	Low pressure switch circuit 2 (only for R1234ze model)

5.3.4 Compressors



Type	Semi-hermetic screw compressors Integrated shut-off valve on the discharge line
Safety	Internal safety valve
Protection	Electronic protection controlling: - the temperature of the motor windings - the oil temperature - the screw rotating direction The compressor motors are equipped with protection on all the three phases and are started by their three-pole contactors.
Oil system	Oil heater Oil sight glass Oil level control (optional) Fine filter 10 µm mesh size

5.3.4.1 Inverter Compressors



Type	Semi-hermetic screw compressors with integrated frequency inverter for variable speed control Integrated solenoid valve for automatic Vi control and for automatic inverter cooling Integrated shut-off valve on the discharge line
Safety	Internal safety valve External rupture disk for A2L refrigerants in case of leakage of inverter refrigerant circuit cooling Line reactor to comply cat. C3 of EN61800-3 and RFI filter to comply cat. C2 of EN61800-3
Protection	Integrated electronic on inverter for protection & controlling of: • the temperature of the motor windings • the oil temperature • minimum oil level • high and low pressure • overcurrent, over and under voltage, phase failure • warnings (or cut out) communication close (or on excess) to the application limits • Inverter electronics temperature monitoring • Oil heater automatic smart control The compressor motor is equipped with protection on all the three phases and is started by the three-pole contactors for safety issues on A2L units.
Monitoring	Data log of all operating parameters with interval about **5** – **10** sec. Memory capacity of about **2** weeks. Alarms message and statistics of the last **36** days.

5.3.5 Electronic expansion valve

Features

The electronic expansion valve used in the **Liebert® AFC** range enables accurate and minimum possible control of the overheating of the gas sucked by the compressor under all load conditions, together with the operation at low condensation and high compressor choking.

The final result of the application of the electronic expansion valve on **Liebert® AFC** is therefore an improved energy operating costs and a higher reliability, thanks to its special adjustment features above all on partial loads, conditions under which every chiller operates for most of the time.

Operation

The superheat setpoint will be automatically adjusted according to the operating conditions and to the application limit of the compressor.

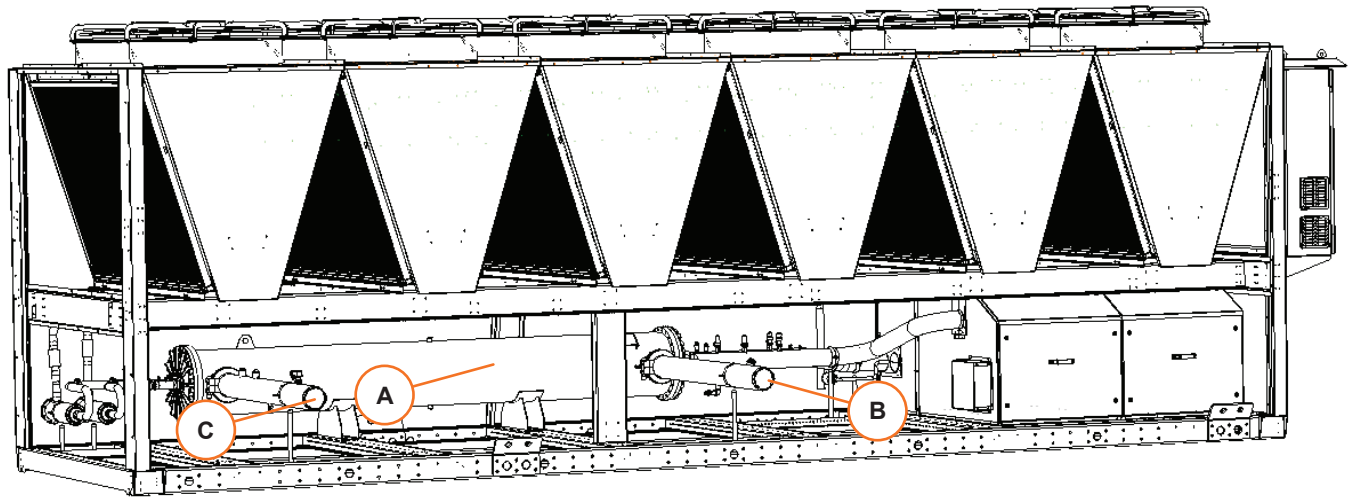
The operating parameters and their programming in the microprocessor dedicated to the EEV control are described in the *Vertiv™ iCOM3™ User Manual.*

5.4 Hydraulic System

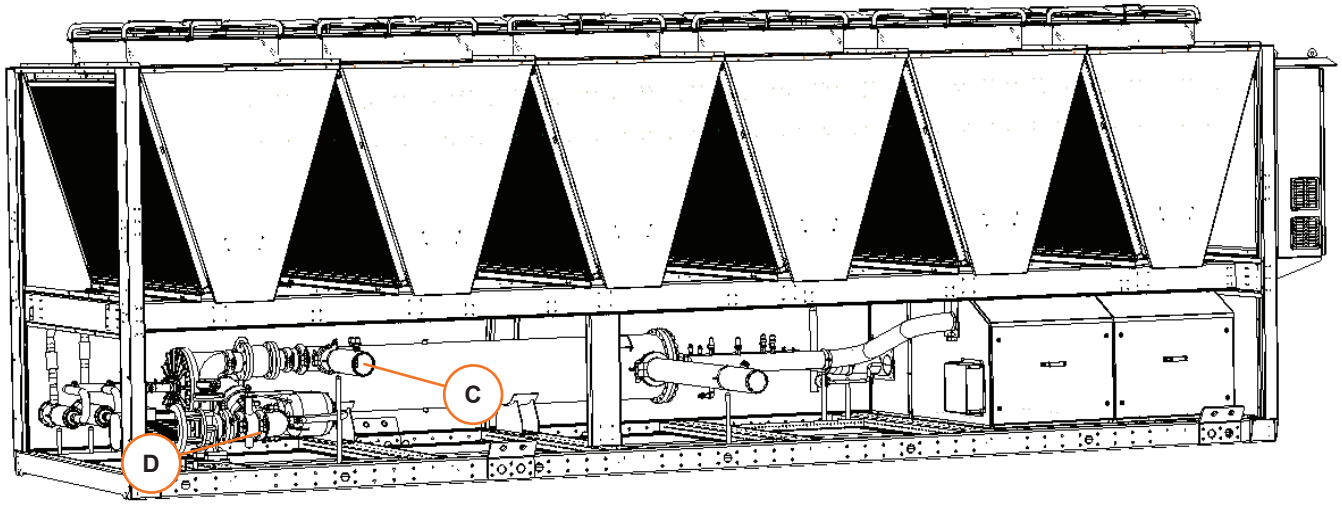
The hydraulic circuit is made up of grooved hydraulic lines ready to be connected to the plant by joints (Grooved pipes connections type).

NOTE *This chapter describes only the components that are part of the **Liebert® AFC** units. The complete water system must be prepared by the customer according to the specifications given in 6.2 Water System Specifications.*

5.4.1 Chiller versions



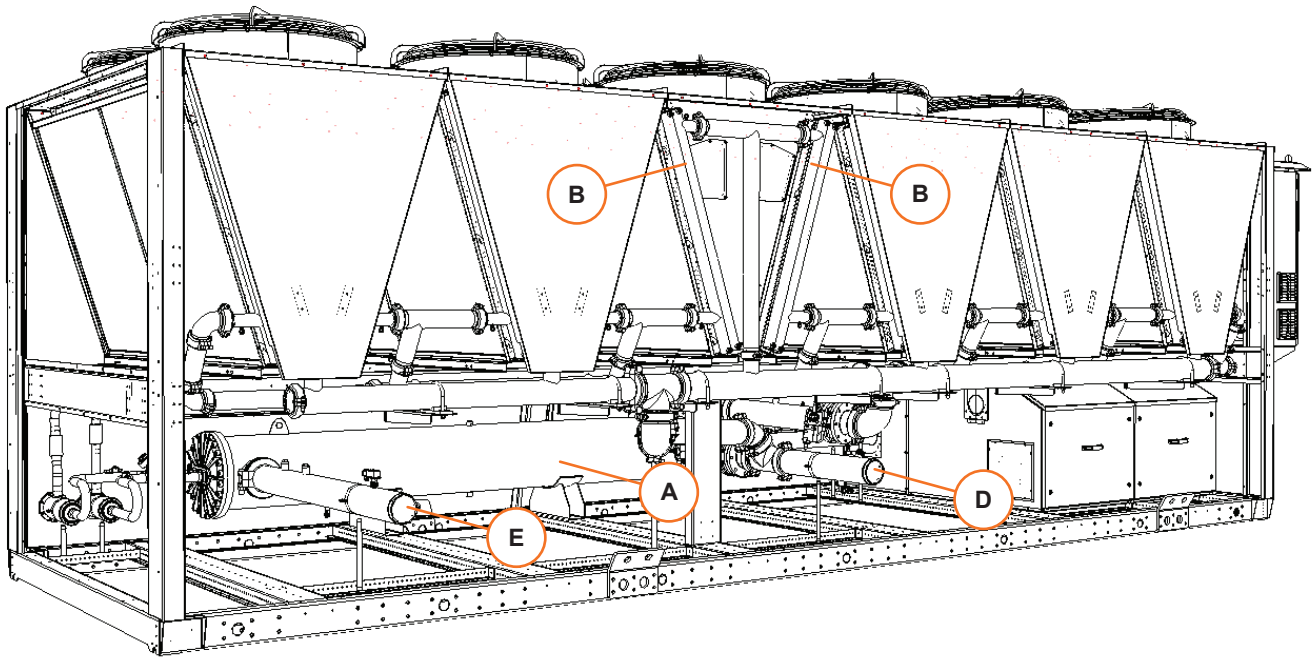
A	Evaporator
B	Fluid inlet connection
C	Fluid outlet connection



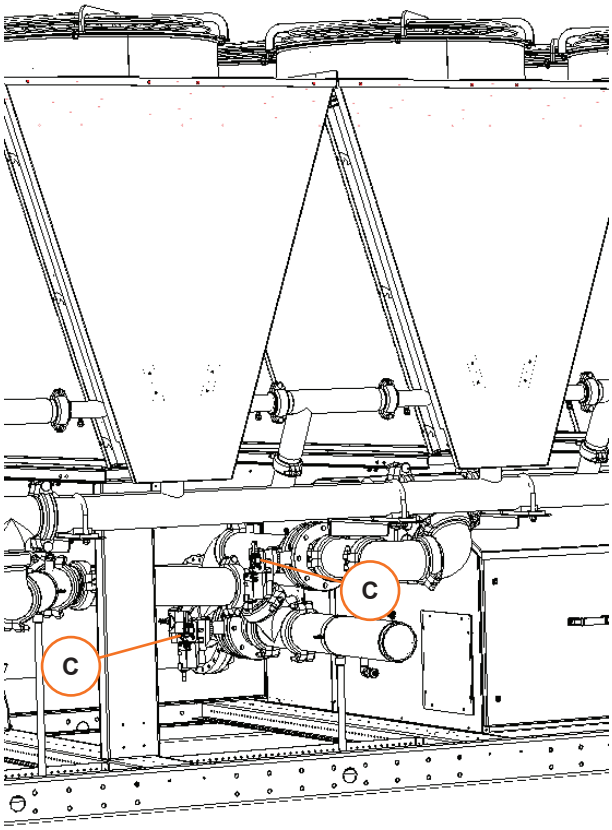
C	Fluid outlet connection
D	User pump (optional)

5.4.2 Freecooling versions

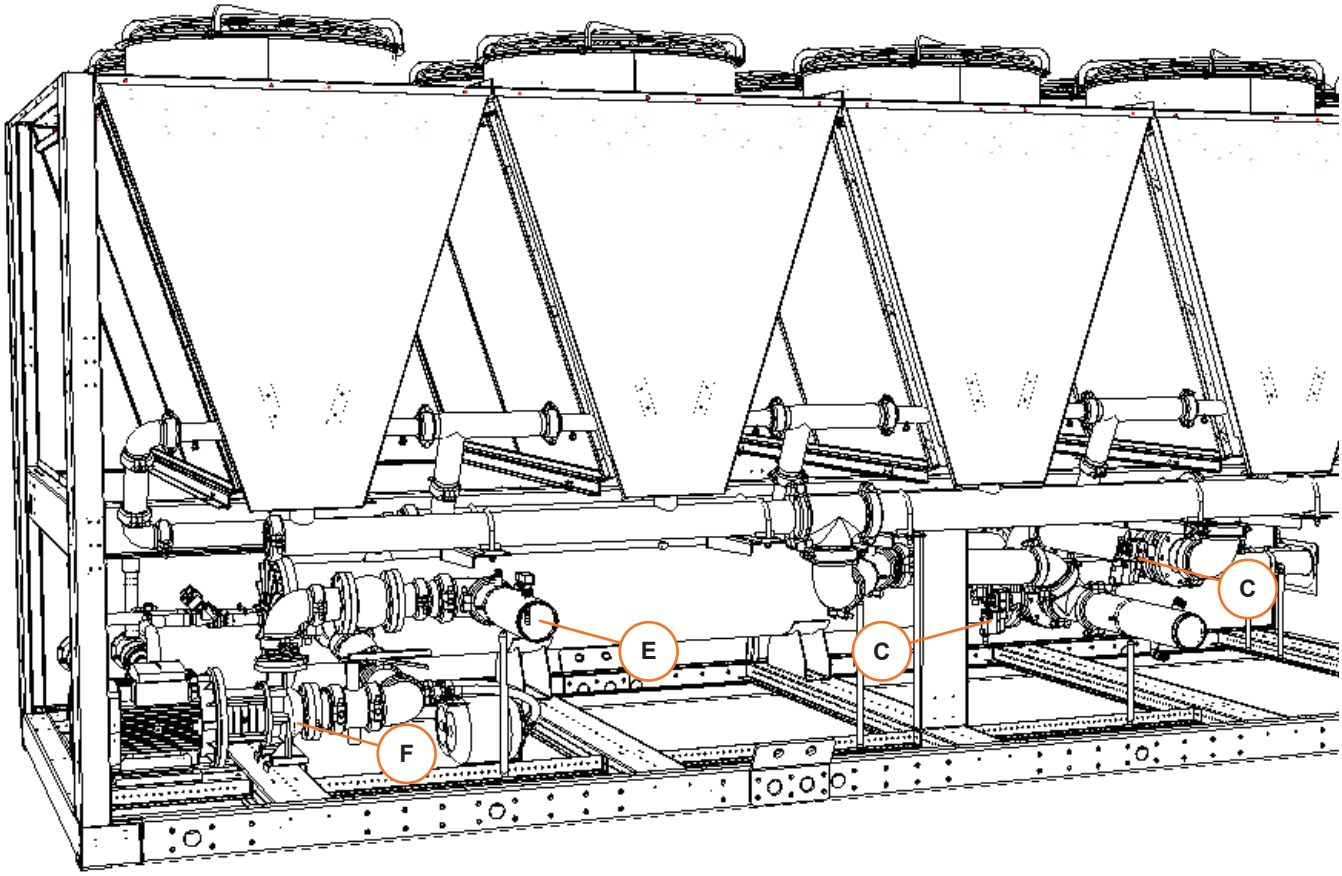
Each water circuit is provided with the following sensors and instruments:



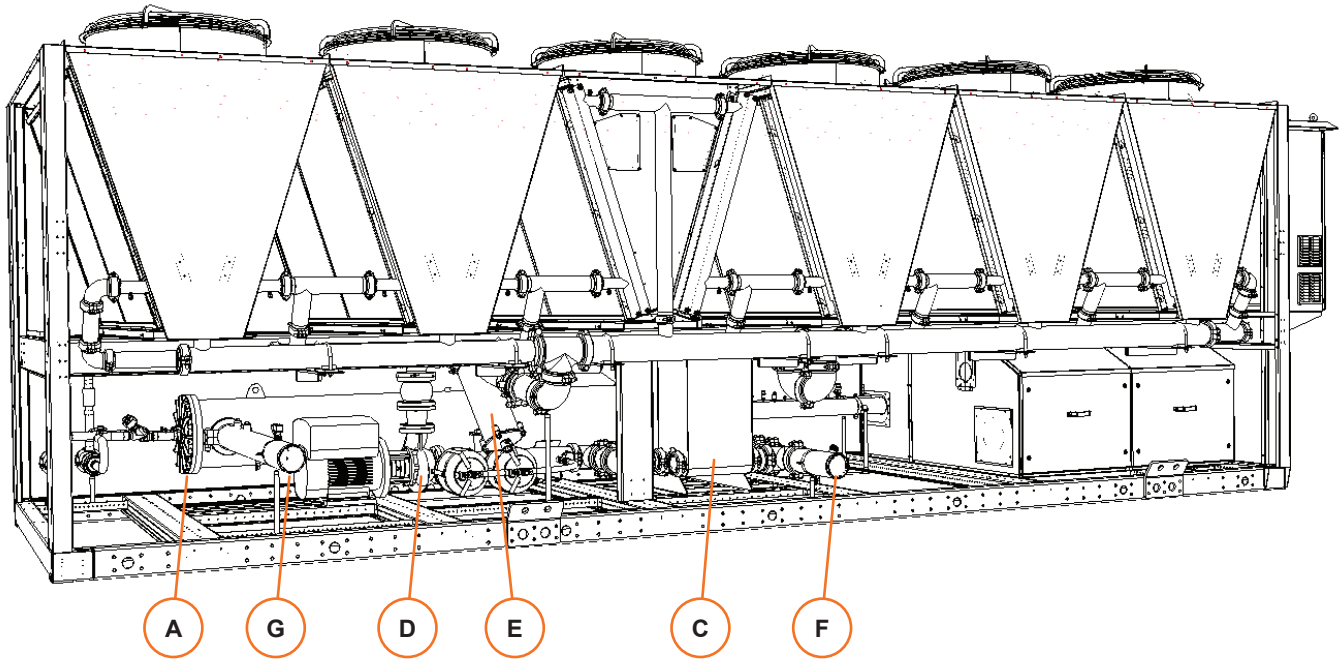
A	Evaporator
B	Freecooling coils
D	Fluid inlet connection
E	Fluid outlet connection



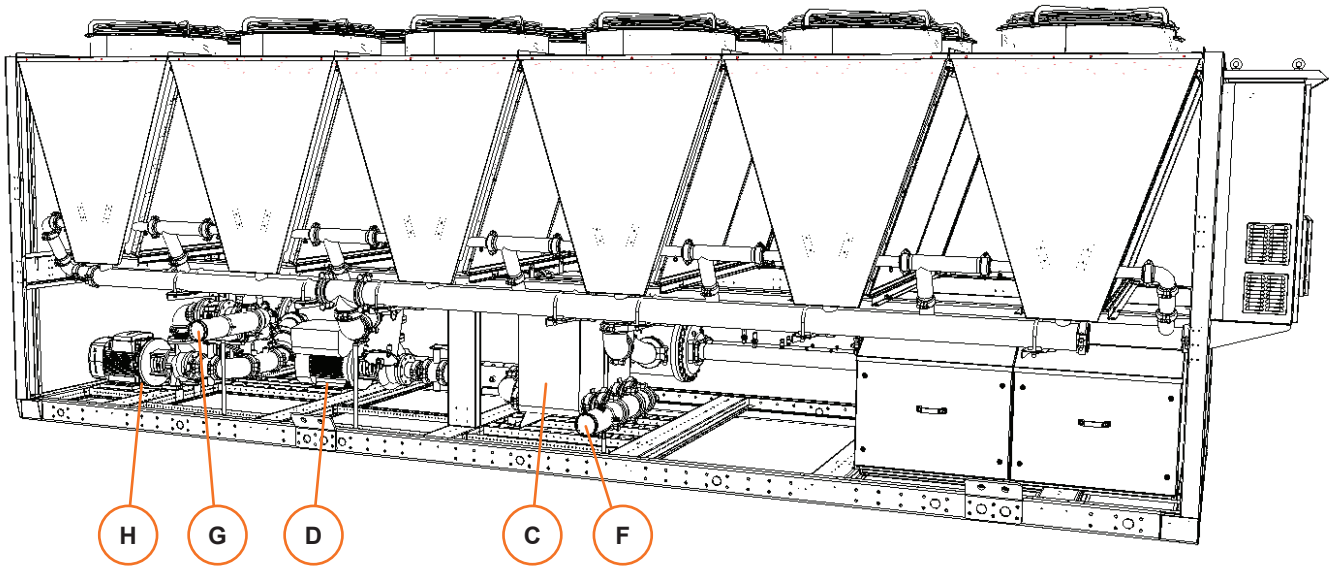
C	Freecooling commutation valves
E	Fluid outlet connection
F	User pump (optional)

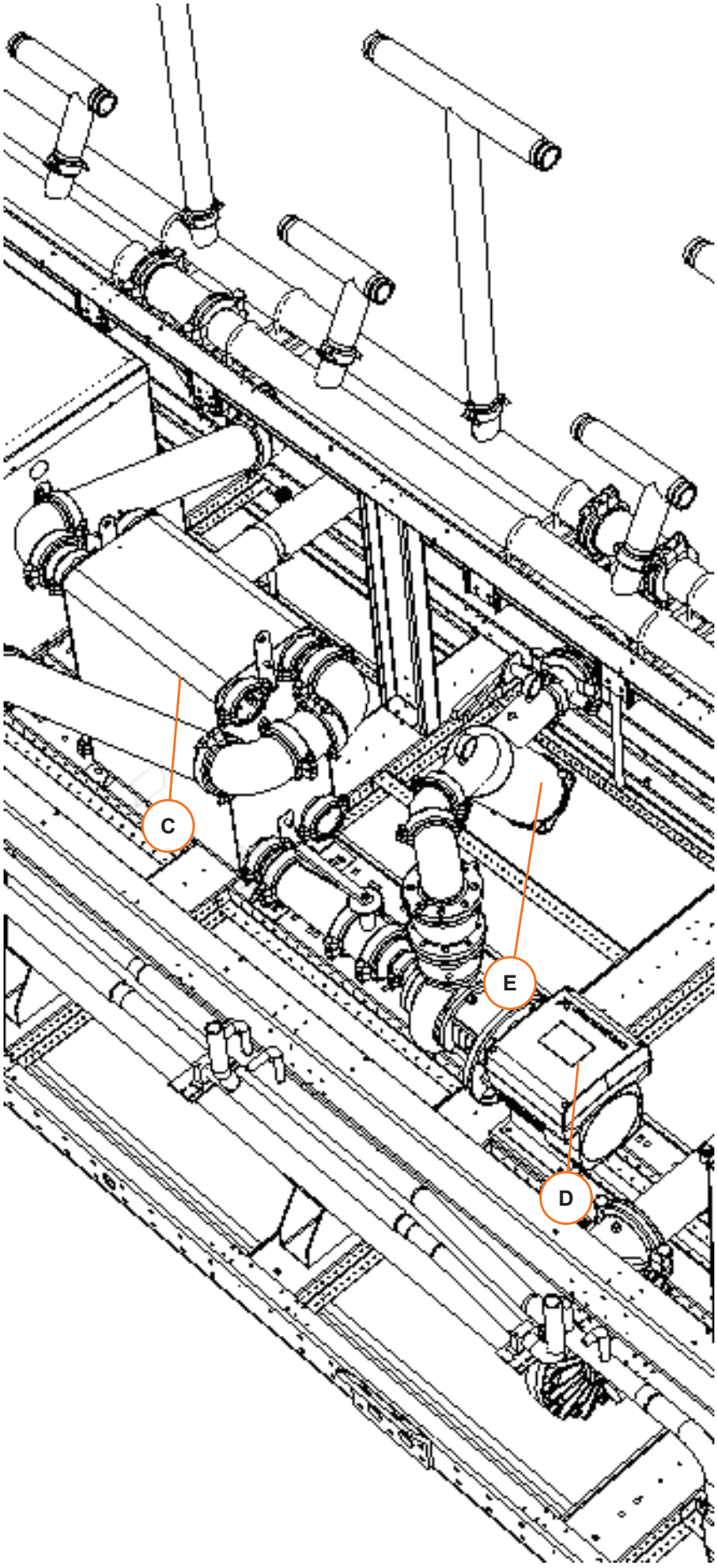


5.4.3 Freecooling glycol-free versions



A	Evaporator
C	Glycol-water exchanger(s)
D	Glycol pump
E	Glycol filter
F	Fluid inlet connection
G	Fluid outlet connection
H	User pump (optional)

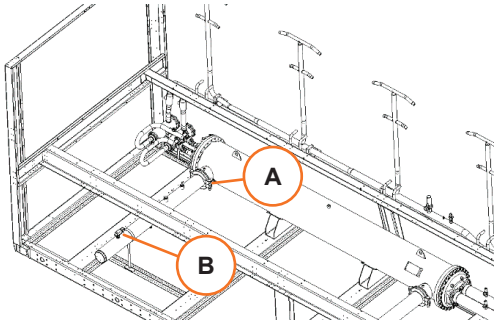


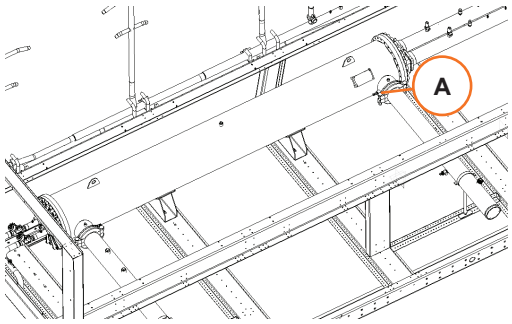


C	Glycol-water exchanger(s)
D	Glycol pump
E	Glycol filter

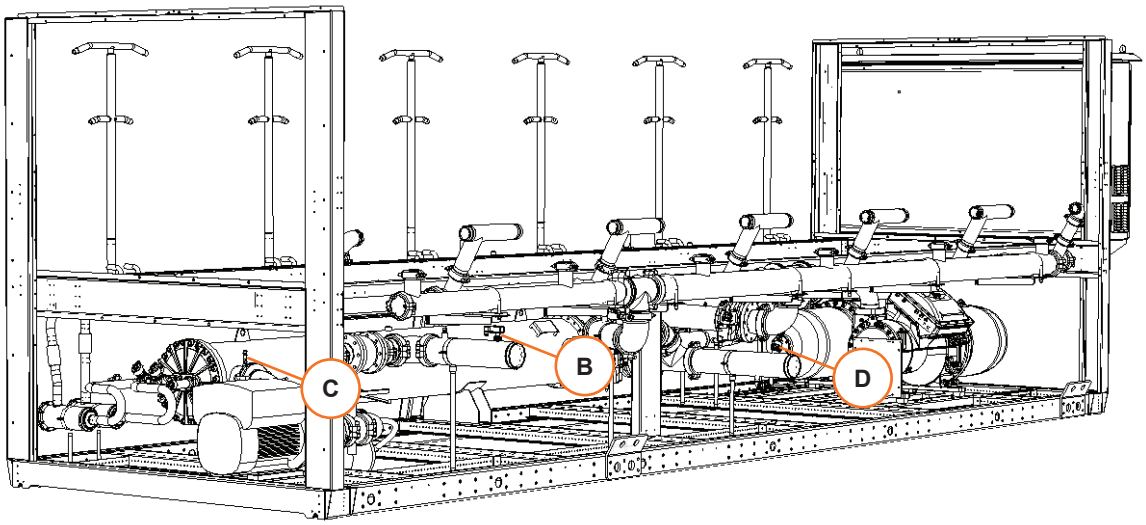
5.4.4 Sensors and instruments

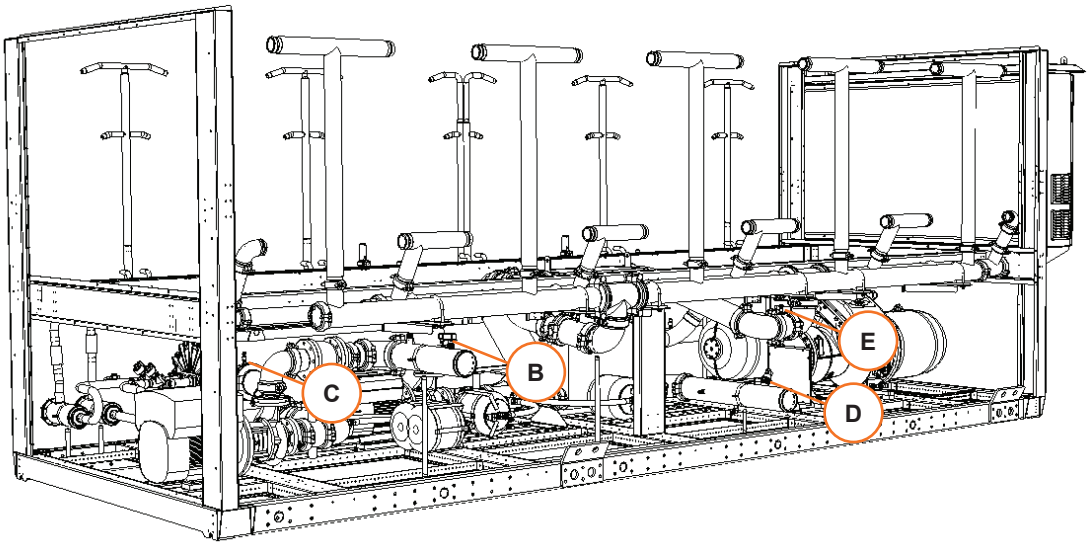
Each water circuit is provided with the following sensors and instruments:





A	Temperature sensors (NTC)
B	Flow switch
C	Anti-vacuum pressure transducer (only with user pump)
D	Flow meter (optional)
E	Pressure transducers (only with microchannel FC coils)

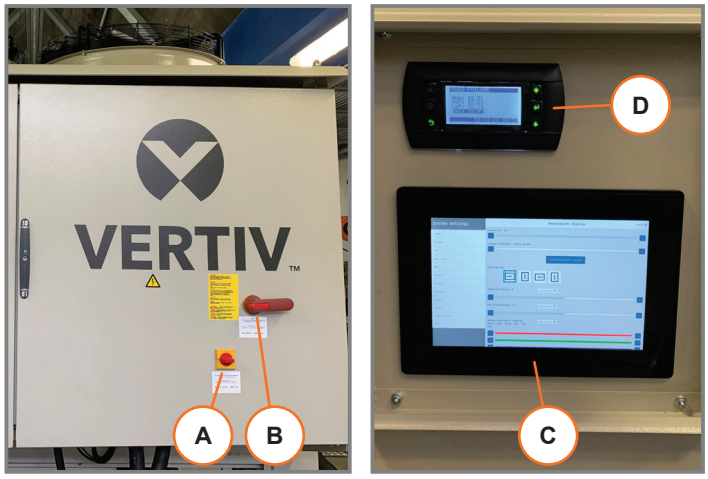




5.5 Electric System

5.5.1 Electric box and main switch

Electric box

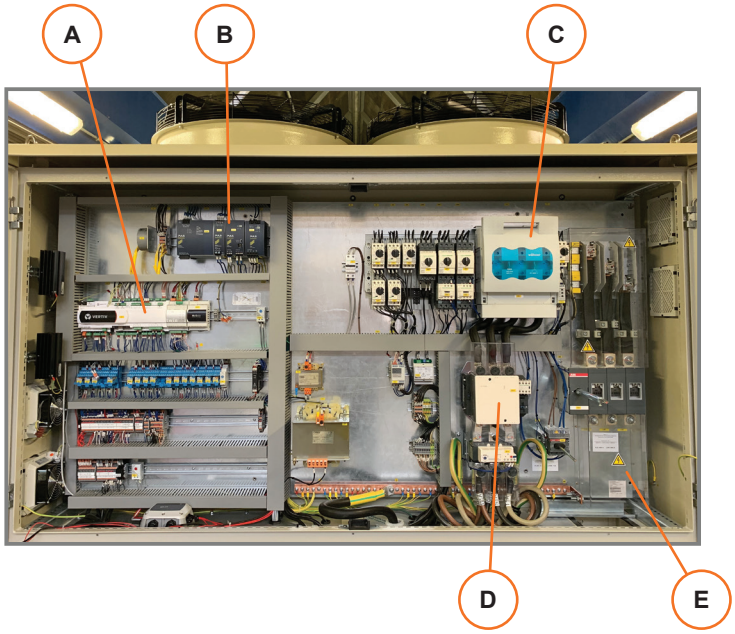


A	Main switch secondary power supply (control and auxiliary systems)
B	Main switch This is a disconnecting switch and cuts **OFF** the electric power supply to the whole unit.
C	Touch screen panel (optional) See the *Vertiv™ iCOM3™ User Manual* for details.
D	Main control panel See the *Vertiv™ iCOM3™ User Manual* for details.

The electrical panel is designed and manufactured according to CEI EN 60204-1.

5.5.2 Electrical connections

Electrical service entrances



A	Control board
B	Ultra-capacitor
C	Fuse holder for compressors
D	Compressor contactors
E	Three-phase electrical connection

5.6 Control System

5.6.1 Vertiv™ iCOM3™

The **Liebert® AFC** water chillers are controlled by the Vertiv™ iCOM3™ microprocessor, managing all of the unit operating conditions.

The user can change and/or modify the operating parameters through the display keyboard installed on the electrical panel.

The electrical control board with fan is equipped with all the safety and operating devices needed for reliable automatic operation.

See the *Vertiv™ iCOM3™ User Manual* for details.

NOTICE

The **Liebert® AFC** are equipped with their own microprocessor control for the water temperature adjustment.

There is no connection for a remote ON-OFF control. Any modification is forbidden.

5.6.2 Protective Functions

The **Liebert® AFC** water chillers are automatically protected through a series of warning and alarm to prevent damages to the chiller itself:

WARNING ON
INLET
Setpoint
22.9°C
OUTLET
Pump
On
ALARM
DATE/TIME
Circuit 1 - Out of Envelope G1 Warning
Local ON
Local OFF 2020/07/02 14:27
Circuit 1 - Out of Envelope G1 Warning 2020/07/02 14:27
Local ON 2020/07/02 14:27
Energy Meter Communication Failure 2020/07/02 14:24
Fans Failure 2020/07/02 14:24
Unit - Low Ambient Temperature 2020/07/02 14:19
Free cooling - Pump warning 2020/07/02 14:24
A178.Active 2020/07/02 14:25
Circuit 2 - EVD Offline 2020/07/02 14:24
Circuit 1 - EVD Offline 2020/07/02 14:24
Unit Inlet Temperature Probe Alarm 2020/07/02 14:20
Ambient Air Temperature Probe Alarm 2020/07/02 14:18
Circuit 1 - Inverter Offline Alarm 2020/07/02 14:24
Critical Condensing Pressure Circuit 1 2020/07/02 14:17
Local OFF 2020/07/02 14:20
Reset All

Pressure control	High pressure and low pressure alarm
Out of Envelope alarm	Modulation of capacity based on the value of high pressure, low pressure, superheat and subcooling and the operating map of the compressor installed.
Oil level	Low level alarm
Refrigerant charge check function	Monitoring of the subcooling value with warning or alarm depending on the working conditions.
Compressors	The compressors are equipped with an electronic protection device blocking their start if the phase sequence is not correct, or stopping their operation if a thermal relay intervenes. This device is essential for the integrity of the mechanical and electrical components of the compressors. In case of stop due to this device intervention: 1. Isolate this device 2. Remove the causes of the lock-out 3. Reset the device by the Vertiv™ iCOM3™

5.6.3 Fast Start Ramp and Control Supply

The Vertiv™ iCOM3™ for **Liebert® AFC** control is fed by direct current for immunizing from network disturbances.

There are **3** possible power supply choices to guarantee reliability and fast start:

Option 0 (None)	The unit is powered by a single three-phase line. The control is powered by an AC/DC converter three phases, that insulate the control from the external electric noises.
Option 1 (Fast Start Ramp – Easy)	The unit is powered by a single three-phase line. A capacitors module (Ultracapacitor) is installed for the direct microprocessor power supplying. In case of main supply power **OFF**, the control is powered for **90** seconds (minimum buffer time guaranteed, the amount of time is function of unit configuration). - If the main supply power restores within the buffer time, the control re-start quickly the controlled components. - If the main supply power restores out of the buffer time, the control starts the reboot procedure and the ultracapacitor requires **15** minutes to recharge completely. More repetition of power **OFF** in a short time and/or long power **OFF** time reduces the minimum buffer time. The ultracapacitor has a potentially unlimited lifetime, not required maintenance. **NOTICE** The ultracapacitor working temperature limits are -40°C ÷ +60°C
Option 2 (Fast Start Ramp – Classic)	The unit is powered by two power lines: - A three phases line for the high power components; - A single phase for the control, provided by a UPS, installed by the customer/user. The control is powered by a AC/DC single-phase converter, connected to the single-phase power line, that insulates the control from the external electric noises. In case of three-phase line power **OFF**, the control remains power supplied by its dedicated power supply line, ready to start quickly when the three phases power **ON**.

5.7 Special Instrumentation

5.7.1 Energy Meter (Optional)

For a complete description, please check the specific manual.
Parameters device are set on factory:

- Currents
- Powers
- Energy values

5.7.2 Water Meter

Safety informations

WARNING

Pressurized System

Depressurize and vent system prior to installation or removal.

DO NOT exceed maximum temperature or pressure specs.

ALWAYS wear safety goggles or faceshield during installation and/or service.

DO NOT alter product construction.

WARNING

Paddlewheel retaining nuts

The retaining nuts of paddlewheel sensors are not designed for prolonged contact with aggressive substances.

Strong acids, caustic substances and solvents or their vapor may lead to failure of the retaining nut, ejection of the sensor and loss of the process fluid with possibly serious consequences, such as damage to equipment and serious personal injury.

Retaining nuts that may have been in contact with such substances, e.g. due to leakage or spilling, must be replaced.

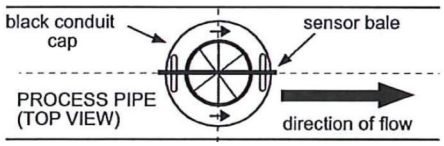
Max. pressure : 12.5 bar at 200°C.

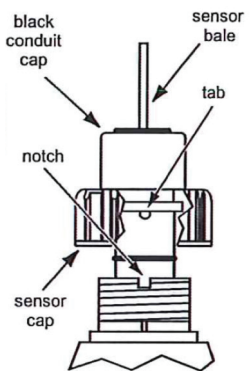
NOTICE

Hand tighten only. Do not use tools!

Overtightening may permanently damage product threads and lead to failure of the retaining nut.

Use of tool(s) may damage product beyond repair and potentially void product warranty.

Characteristics	Flow rate range 0.1 to 6 m/s (0.3 to 20 ft/s) Installs into pipe sizes DN15 to DN900 (½ to 36 in.) High resolution and noise immunity Chemically resistant materials Easy to replace rotor
Installation	Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system. Using an alternating/twisting motion, lower the sensor into the fitting, making sure the installation arrows on the black cap are pointing in the direction of flow, as shown in the following figure:  Engage one thread of the sensor cap then turn the sensor until the alignment tab is seated in the fitting notch. Hand tighten the sensor cap. Do not use any tools on the sensor cap otherwise the cap threads and/or the fitting flange threads will be damaged.



5.8 Options: Auto-monitoring on the capacity / efficiency data indicative of the unit

Liebert® AFC can be equipped with the following options:

- **ENERGY METER** which provides the reading of the instantaneous consumption of electricity (including the consumption of the pump main if this is integrated in the machine)
- **FLOW METER** that provides the flow rate of the chilled water (m / s)

IF THE REFRIGERATED WATER FLOWMETER IS PRESENT, THE CONTROL UNIT IS ABLE TO PROCESS AND PROVIDE THE FOLLOWING DATA:

- Total capacity (kW)
- Mechanical capacity (kW)
- Free-cooling cooling capacity (kW)

IF IN ADDITION TO THE REFRIGERATED WATER FLOWMETER, THE ENERGY METER IS PRESENT, THE CONTROL UNIT IS ABLE TO PROCESS AND PROVIDE THE FOLLOWING DATA:

- **EER** (including the main pump consumption if it is integrated in the machine)
- **pPUE** (including the main pump consumption if it is integrated in the machine)

The capacity depends on the instantaneous measured value of the fluid flow, the temperature and the percentage of glycol (to be set on the unit control)

- **EER** is the ratio between the instantaneous value of the reading of the total cooling capacity and the total consumption of electricity (in the same time period)
- **pPUE = [1 + (1 / EER)]**

All data and data outputs are calculated as instantaneous value and even the site operating conditions cannot guarantee stable measurements, so they can only provide indicative values. These values should not be considered as valid official performance measurements due to the measurement conditions and accuracy levels of instruments (other than measurement conditions and laboratory instruments).

5.9 Options: Pump group

All models of the **Liebert® AFC** series can be equipped with double factory-connected water circulation pumps. On each unit it is possible to select the type of pump (low or high head) both in the standard version and with inverter and integrated electronic regulation. All pumps are dynamically balanced according to ISO 1940 class 6.3. The electronic pump regulation algorithm allows you to modulate the pump speed so as to keep the flow rate constant through the evaporator even when the hydraulic load changes: this allows a significant energy saving, variable according to the applications. In particular in the Freecooling units this beneficial effect occurs especially in the summer season when the Freecooling battery is short-circuited.

The inverter pump can also be regulated according to the “variable flow” logic managed according to particular algorithms determined by plant requirements; the pump and machine safety devices and protections are always guaranteed; for further explanations, read the following paragraph Options: *5.11 Variable Primary Flow* with **Liebert® AFC.**

The pumps are suitable for operation with ethylene glycol-water mixture up to 35/65% by weight and refrigerant fluid temperatures up to 4°C. The pumps are of the monobloc centrifugal type, with two-pole electric motor with IP54 protection, Class F insulation and at least IE3 efficiency class.

Motors with this efficiency class (the highest on the market) not only guarantee greater energy savings compared to pumps with a lower efficiency class, but also allow a quieter operation of the electric motor and allow to reach very high limits use at room temperature (up to 60°C). The pump housings are made of cast iron, as well as the impellers, the stainless-steel shafts and the mechanical seals in silicon carbide / EPDM with dimensions according to EN12756, suitable for use of water mixtures containing ethylene glycol.

The hydraulic circuit of the pump includes a check valve on the delivery of each pump. The pump body, the lantern, the stator body and the fixing bolts are subjected to electrophoretic painting; this allows the use of these pumps in outdoor environments subject to atmospheric agents without any problem of corrosion. Each pump is also equipped with an automatic electrical protection switch. The microprocessor controls manage the rotation and stand-by of the pumps and automatically start the pump in stand-by in case of failure of the primary one.

If the electronic inverter pump is replaced, all the parameters must be set; this intervention must be carried out by a Vertiv™ expert technician.

5.10 Options: Hydraulic Kit

Consisting of an expansion tank (preloaded at 1.5 bar, maximum operating pressure 10 bar) and a safety valve calibrated at 6 bar.

Expansion vessel volumes: 12 liters.

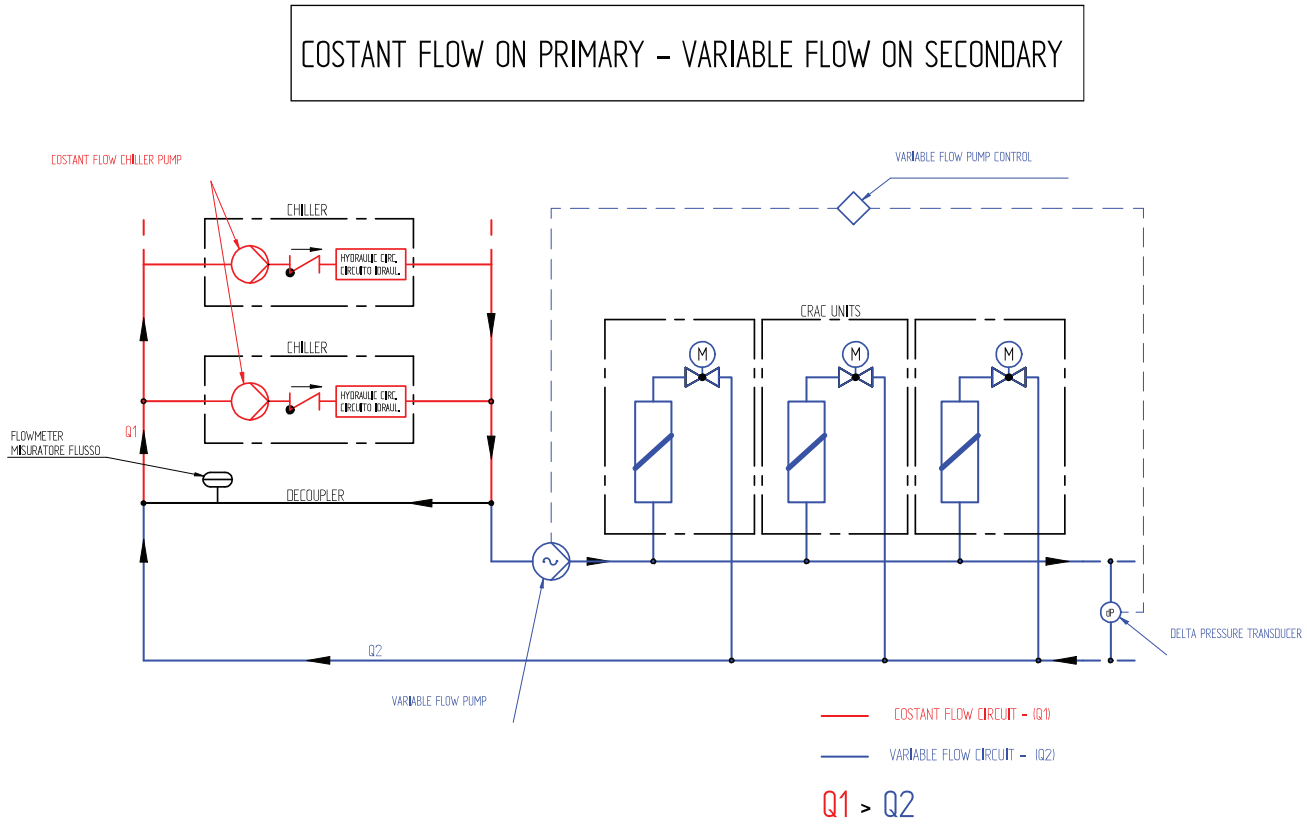
It is recommended to always check the total capacity of the expansion tank based on the percentage of glycol in the mixture, the expected maximum temperature variation of the mixture and the total hydraulic volume resulting from the sum of the internal volume of the unit with the volume of the user circuit.

5.11 Variable Primary Flow

5.11.1 General Overview of VPF Hydronic Systems

The Variable-Primary-Flow (**VPF**) hydronic system is an evolution of the concept of the constant primary–variable secondary design, more commonly known as the “decoupled” system.
A comparison of the hydraulic schematics in *Figures 1* and *2* shows the similarities and differences between “decoupled” and VPF systems.

Figure 1



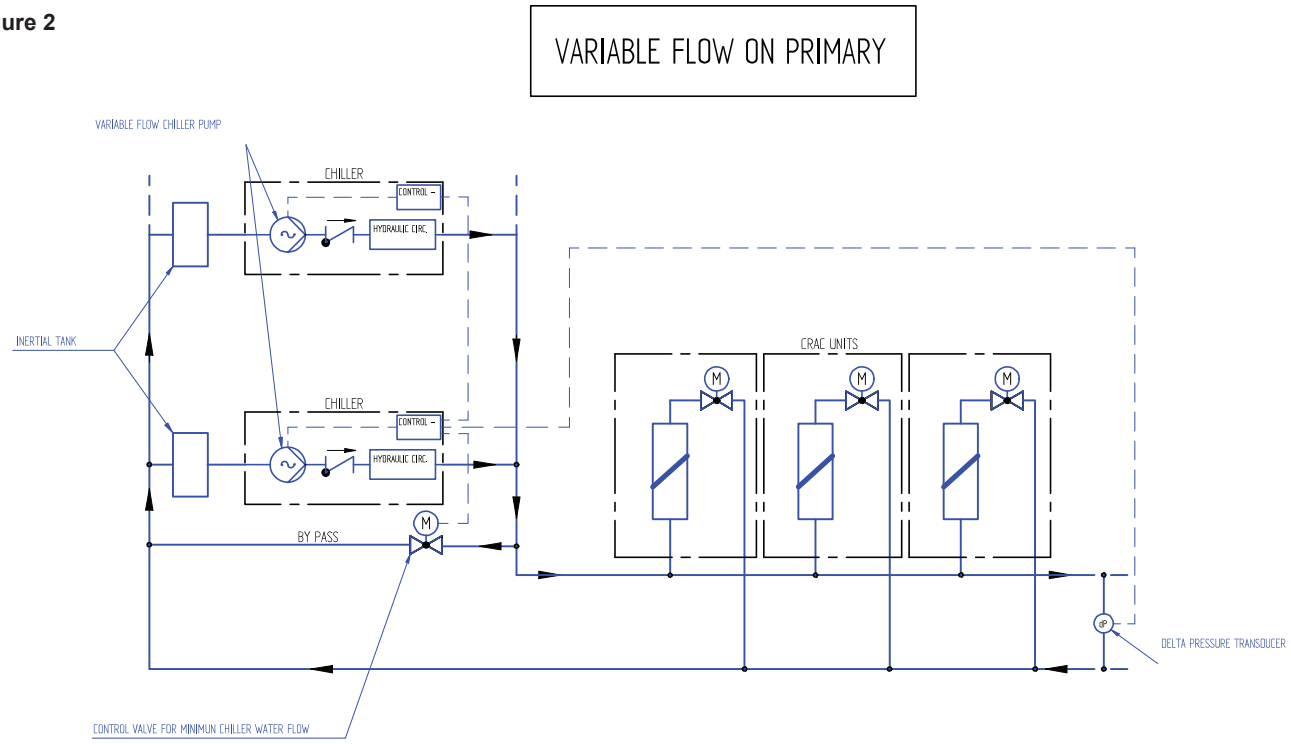
The “decoupled” system shown in *Figure 1* uses constant water flow through each chiller and variable water flow through each CRAC unit to satisfy the data center loads.

This hydronic design requires:

- a constant-speed pump (and check valve) for each chiller;
- two-way control valves embedded in each CRAC unit to regulate the amount of chilled water that flows through the cooling coils;
- a variable-flow secondary circuit distribution pump to serve the CRAC units coils (usually managed by a drive that read and keep constant DP through CRAC units);
- a bypass to hydraulically decouple the primary (production) and secondary (distribution) sides of the system able to manage the water flow of the largest chiller (primary) pump;
- for multi-chiller systems, a BMS or a Chiller Sequencer Controller able to maintain Primary Flow higher than the secondary one.

Each CRAC unit adjusts the flow of chilled water to satisfy the data center's cooling demand, consequently the secondary circuit distribution pump responds by regulating the amount of chilled water delivered. Specifically, the secondary flow rate is produced to maintain the necessary system pressure differential. As the primary loop's water flow cannot deliver a step-less modulation, water flows through the bypass to balance the system. Primary flow must always meet or exceed the secondary flow. Any excess primary water flows through the decoupler to the return side and back to the chillers. Any time the primary flow is less than the secondary flow, warm return water will flow "backwards" through the decoupler and mix with the primary flow going out to the Data Center. This condition (known as Low DT Syndrome) has to be avoided because the chiller load control is based on return temperature of the primary circuit. It means that DT on secondary circuit has to be always higher than DT on primary or water flow on primary circuit has to be always higher than flow on secondary one.

Figure 2



The VPF system in *Figure 2*, varies water flow throughout the entire system through each operating chiller as well as through the CRAC units. The variable flow logic can be implemented also with different hydraulic configurations, with similar logic (for example with variable flow primary pumps external to the chillers, which can be either one pump in series to each chiller, or connected in a single manifold and put in series with the chillers' system).
This hydronic design requires:

- Two-way control valves for each CRAC unit, to regulate the amount of chilled water that flows through the cooling coils;
- Variable-flow chiller pumps, to eliminate the need for a separate secondary distribution pump;
- A pressure transducer, able read and keep a constant Delta Pressure through the CRAC units, by managing the speed of the primary pumps;
- A bypass positioned upstream the CRAC units, able to manage the minimum water flow admitted by the primary loop (which corresponds to the minimum load admitted by the single chiller);
- A control valve in the bypass which ensures that the amount of flow that returns to the operating chiller(s) never falls below the minimum limit;

- Inertial tank at each chiller water inlet in order to ensure the requested thermal inertia for a proper chiller capacity regulation (the chiller load control is based on return temperature of water loop).

The VPF system is designed to maintain a constant DT through the entire water loop (CRAC and Chiller); the variation of the thermal load is done from the change of flow until where it is possible corresponds to a variation of flow on all the circuit, until the minimum flow admitted by the primary loop is reached. For lower flows, the primary loop remains at the minimum flow, while the excess flow is bypassed in the bypass pipe.

On VPF system in *Figure 2* there are several cost-saving benefits not only directly related to the pumps.
The most obvious cost savings comes from energy saving at part load where the inverter pumps allow reducing their power consumption more than proportionally to the flow reduction; in addition eliminating the secondary distribution pump and having a single set of pumps enables simplification on design that ensures substantial savings in initial investment costs.

With the same thermal load required, the VPF system (operating within the working limits indicated below), increases operation efficiency of both the traditional chiller (better evaporator efficiency) but especially of free cooling units, increasing significantly the FC utilization factor during the year, thanks to the higher freecooling inlet fluid temperature at partial load, if compared to a fixed primary flow system.

On the other hand, VPF requires more robust (complex and properly calibrated) control system with coordinated control of chillers, pumps and isolation valves (if present). Of course this implies potentially longer commissioning times to tune the system and experienced facility managers to operate/maintain properly.

5.11.2 Options: Variable flow primary with Liebert® AFC

A variable water flow involves changes in the functionality of the chiller because the load changes directly proportionally. **Liebert® AFC** units with the variable flow option are designed for this working condition, provided that the variations in the water flow remain within the defined limits of minimum flow, maximum flow and maximum speed of variation of the flow.

The maximum recommended change for the water flow rate is 10% of the nominal flow rate per minute. This limit is valid if the recommended inertial water volume is present on the hydraulic connection at the inlet to the chiller. Exceeding this limit could adversely affect the control of the **EEV** (Electronic Expansion Valve) and the reliability of the compressors.

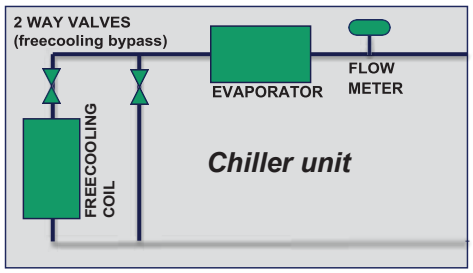
A flow below the minimum values can create a laminar flow through the exchangers causing problems of freezing, fouling, loss of efficiency and poor control. A flow rate higher than the maximum values will lead to unacceptable pressure drops and can cause excessive erosion, which could potentially lead to failure.

In assessing the minimum flow rate for each model, the accuracy required for the Leaving Water Temperature (**LWT**) by the chiller must be carefully considered according to the quantity and type of compressor regulation.

The unit controller manages the maximum and minimum limit of the flow rate and its fluctuations; if during operation the unit approaches the indicated limits, a warning is generated and then an alarm with a different strategy depending on whether the pump is installed on the unit with inverter or not.

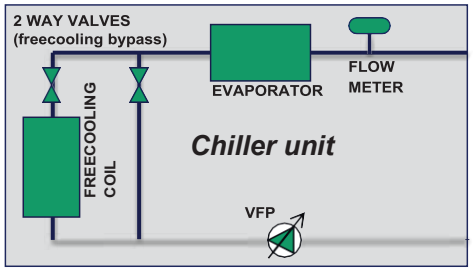
VPF solutions available for Liebert® AFC

Three types of variable flow primary logic are available for **Liebert® AFC**:



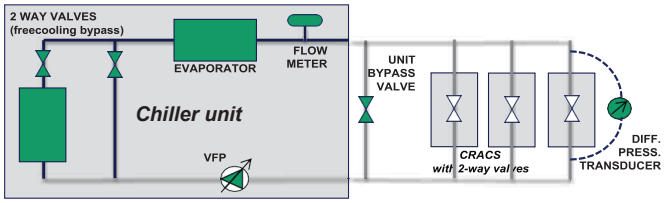
VPF Solution A:

- **AFC** without pump;
- A built-in flow meter reads the variable flow rate in entrance
- The **AFC** thermal regulation logic adapts automatically under flow conditions;
- Unit limits (max / min flow rate, max variation speed) → if the limits are exceeded, **AFC** generates a warning and subsequently an alarm.



VPF Solution B:

- **AFC** with pump with inverter (also available with second backup pump);
- **AFC** adjusts the primary flow rate based on a request external (BMS) with 4-20 mA or 0-10 V signal;
- The **AFC** thermal regulation logic adapts automatically under flow conditions;
- Unit limits (max / min flow rate, max variation speed) automatically guaranteed.



VPF Solution C:

- **AFC** with pump;
- A built-in flow meter reads the variable flow rate in entrance;
- The **AFC** thermal regulation logic adapts automatically under flow conditions;
- Unit limits (max / min flow rate, max variation speed) → if exceeding the limits, **AFC** generates a warning and subsequently an alarm:
- Integrated differential pressure transducer;
- Integrated bypass valve for operation with loads close to zero.

Solution A: unit without pump, designed for operation with variable flow primary.
Variable flow regulation is passive: the chiller does not include the primary pump. The chiller adapts its thermal regulation logic to the variable flow of the incoming water (supplied by the external pump) within the application limits indicated in the previous paragraph. This solution is recommended if the pumps with external inverters are supplied by the customer; in this case, attention must be paid to the flow limits and its fluctuations to allow the unit to work without warnings / alarms; this solution can be applied to the VPF system and to a hydronic system with primary / secondary water circuit with variable flow also on the primary.
For multichiller applications, a motorized gate valve is required on the connection of the water entering the chiller and a chiller sequencer or a BMS capable of managing both the gate valve and the sequence / rotation of the chillers.
It does not require to be electrically powered.

Solution B: unit with pump (or double pump), primary with variable flow controlled by external request (BMS).
Variable flow regulation is passive: the chiller regulates the primary flow on the basis of an external request which must be supplied with a 4-20 mA or 0-10 V signal, within the application limits indicated in the previous paragraph. This solution is recommended when the pumps with inverter are managed but not supplied by the customer; in this case, the BMS must control the flow limits and its fluctuations in a similar way to solution A, but with the additional advantage that the control of the **Liebert® AFC** provides a higher level of safety since it is able to filter the request BMS external to avoid flow warnings or alarms. This solution can be applied to the VPF system and to a hydronic system with primary / secondary water circuit where with variable flow also on the primary. In both cases, however, it is necessary to have a system with BMS that can read the flow rate conditions of the hydronic system and correctly manage the variable flow pump installed on the unit.
For multichiller applications it is not necessary to provide a motorized gate valve for each chiller because the units are each **Liebert® AFC** with this option it is equipped with a check valve on the pump delivery; in any case, the BMS must manage not only the flow rate as mentioned above, but also the sequence / rotation of the chillers.
See wiring diagram attached to the machine.
Electrically connect the BMS signal to the A10 equipment (configurable optocoupler - see its data sheet included in the documentation attached to the machine) using the terminal block:

- XC2: 1110 + 20V DC;
- XC2: 1111 + 0VDC;
- XC2: 1112 Signal.

Solution C (with additional accessories kit for delta pressure control): unit with pump (or double pump), primary with variable flow controlled by **Liebert® AFC** according to the pressure delta in the circuit. As standard, this solution is only available for systems with a single chiller. The variable primary flow is active and guided by the **Liebert® AFC** to maintain a set pressure delta in the CRAC units. It is very important to follow the installation instructions for the unit bypass valve (near the chiller with the shortest bypass tube based on the nominal diameter of the valve) and for the differential pressure transducer on the farthest pipe of the system as indicated on the previous drawing. These components are supplied separately in kits and their hydraulic connection and electrical wiring to the **Liebert® AFC** must be done on site.

The hydraulic balancing valve must be positioned a downstream of the tank, the chiller and the 2-way bypass valves.

The bypass valve (managed by the unit control) ensures that the quantity of flow that returns to the chiller in operation never drops below the minimum limit.

The table below shows the correct correspondence between each model and the relative kit, with the minimum flow values and the general characteristics of the valve / motor.

Kit p/n	Min flow with 30% e.g. [mc/h]	Kv	By pass 2 way valve	DN valve	Motor valve	Press. Transducer
455545	30 to 50	63	VVF32.65-63	DN65	SKB62	DPI 0-400 kPa
455546	51 to 80	100	VVF32.80-100	DN80	SKB62	DPI 0-400 kPa
455547	81 to 160	160	VVF32.100-160	DN100	SKC62	DPI 0-400 kPa

NOTE: *Motor with spring return IP54, heating element*

The pressure delta set point in the CRAC units is configurable (between min 60 kPa → limit on valve selection and max 400 kPa → limit on pressure transducer reading)

Usually the delta P set is equal to or greater than the pressure drop of the CRAC unit at full load, to obtain the projected water flow rate at full load throughout the hydraulic circuit and in a single CRAC unit.

Liebert® AFC will manage the pump speed so as to keep the delta P constant in the water circuit. When the water flow required by the CRAC unit is lower than the minimum water flow allowed by the chiller, the 2-way bypass valve begins to open to continue sending the minimum flow through the chiller and at the same time maintaining the delta P required in the water circuit of the CRAC unit.

To ensure system stability and avoid fluctuations, it is preferable to have a carefully balanced hydraulic system on the CRAC unit side. For this reason it is recommended to mount independent 2-way Pressure Regulating Valves (**PRIV**) on the CRAC units.
See wiring diagram attached to the machine.
Electrically connect the differential pressure switch (DP water) to the A10 equipment (configurable optocoupler) using the terminal block:

- XC2: 1110 + 20V DC;
- XC2: 1111 + 0VDC;
- XC2: 1112 Signal.

Electrically connect the Bypass valve of the machine (Ybypass - see its data sheet included in the documentation attached to the machine) to the A12 equipment (configurable optocoupler - see its data sheet included in the documentation attached to the machine) install A10 equipment using the terminal block:

- XC2: 1115 GND signal;
- XC2: 1116 signal + 0VDC;
- XC2: 1117 0V AC supply;
- XC2: 1118 + 24V AC supply.

Adjust the machine bypass valve (Ybypass) as explained in the wiring diagram
Install and electrically connect the heating unit bypass valve (Ybypass Heating - see its data sheet included in the documentation attached to the machine) using the terminal block:

- XC2: 1117 0V AC supply;
- XC2: 1118 + 24V AC supply.

5.12 Compressors motor power factor correction with capacitors (option)

Caution: Discharge and short circuit capacitor before handling!

This option is not available for inverter compressors.

Enhancing power quality – improvement of power factor – saves costs and ensures a fast return on investment. In power distribution networks, PFC focuses on the power flow (cos ϕ) and the optimization of voltage stability by generating reactive power – to improve voltage quality and reliability at distribution level.

PhaseCap capacitors in cylindrical aluminum cases have been designed for power factor correction in low-voltage applications. Dielectric is made of propylene film.

Safety:

- Self-healing;
- Overpressure disconnector;
- Shock hazard protected terminals;
- Discharge resistor pre-mounted;
- IP54 with terminal CAP;
- -40D execution with -40° / +55°C min / max working air temperature.

Capacitors are activated when the compressors are operating; their contactors are selected for this particular use in combination with discharge throttle.

A relay normally open has to be managed by customer in order to enable their operation, so it's necessary to read carefully the following notes before enabling their full functionality.

It's recommended to disable capacitors:

- After power **OFF** and before switching the power from the main line to the genset power line;
- When there is low power input quality like:
  - Transient over under voltage;
  - Transient over current;
  - Interaction with other reactive power components, and also parasitic capacitances (cable) or inductivities in common circuits;
  - Network harmonics, resonances created by harmonics or flicker even when they occur only briefly or cyclically;
  - Network harmonics are normally produced in the operation of electric loads with a non linear voltage / current characteristic as rectifiers and inverters for drives, welding apparatus and uninterruptible power supplies.

Harmonics and relevant resonance may cause very high overcurrents which can lead to capacitor failures, and worst case, to explosion and fire.

5.13 Accessories

The customer is responsible for the installation of the accessories, which are provided separately.

5.13.1 Anti-vibration support

The anti-vibration supports have the function of isolating the structure, on which the chiller is placed, from the vibrations created by the chiller itself.

NOTICE

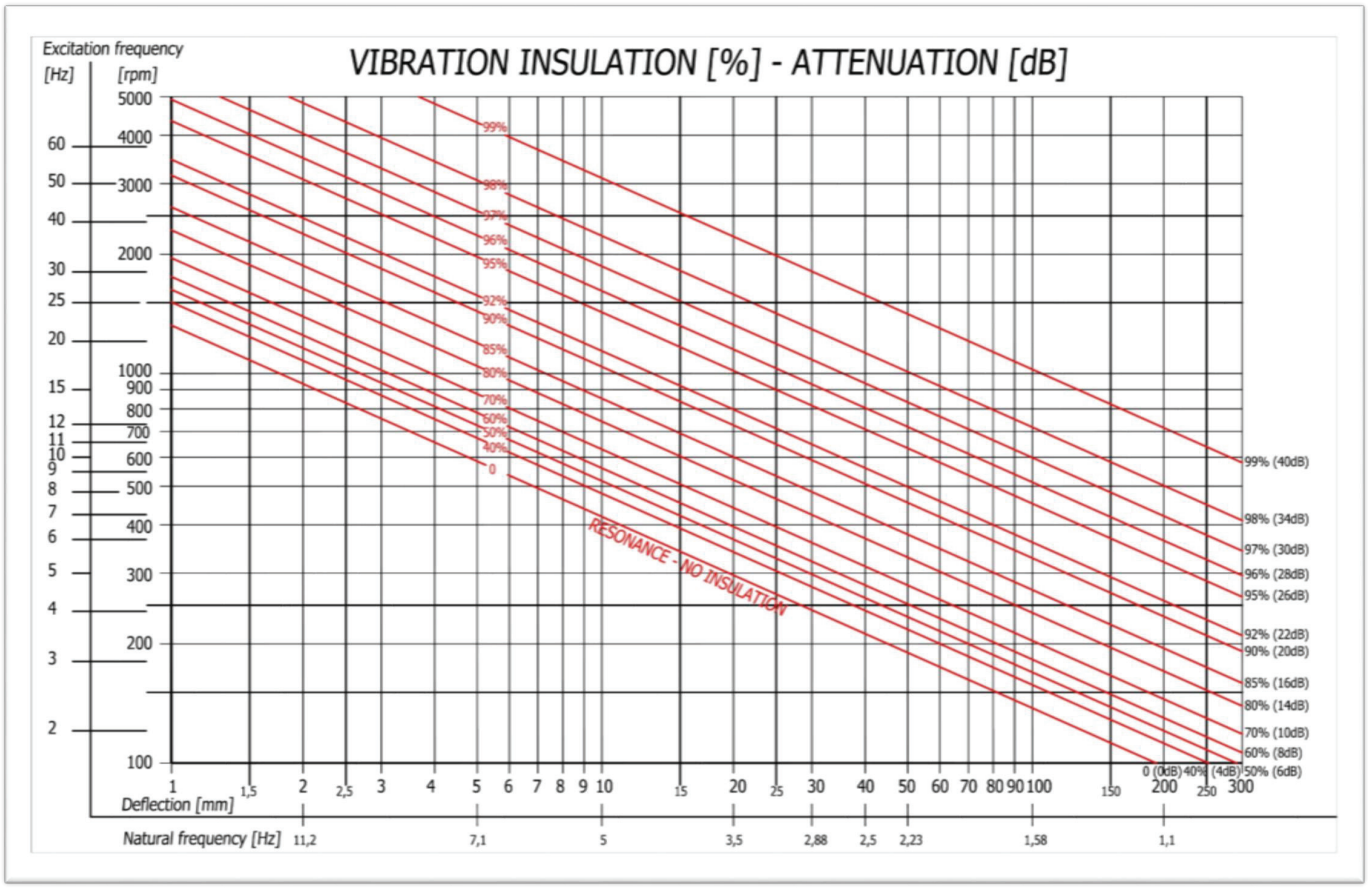
For more complete information, please refer to the dedicated manual (code 10041956MAN_ENG) provided with the anti-vibration supports kit.

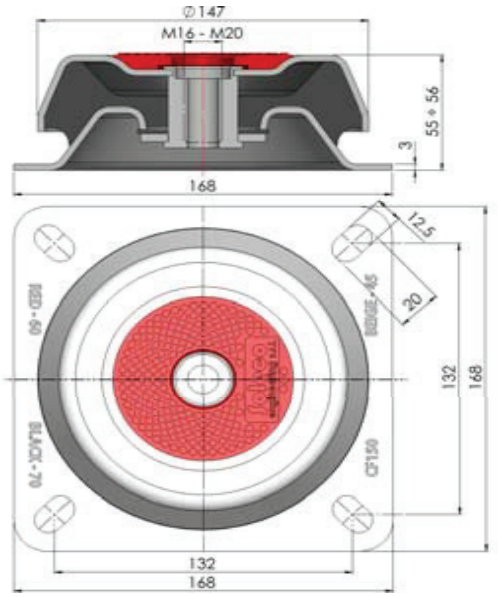
They can be of the rubber or spring type, sized and selected on the basis of the expected level of insulation calculated starting from their elastic characteristics and the weight supported by each of them.

There are therefore various kits of vibration dampers combined with each chiller, identifiable in a dedicated manual which also illustrates the procedures for their correct installation.

Unit	10 - 12 fans	6 stands
	14 - 16 fans	8 stands
	18 - 20 fans	10 stands

The rubber antivibration mounts are able to isolate vibrations with an efficiency of about 70-80% for forces of 20 Hz (1200 RPM).
The spring antivibration mounts are able to isolate vibrations with an efficiency of about 90% for forces of 14 Hz (850 RPM).





Elastic body: Natural rubber.

Operating temperatures: -20°C +90°C

Metal body: Zinc UNI ISO 2081Fe/Zn 15c Awhite Steel UNI EN 10111 DD13

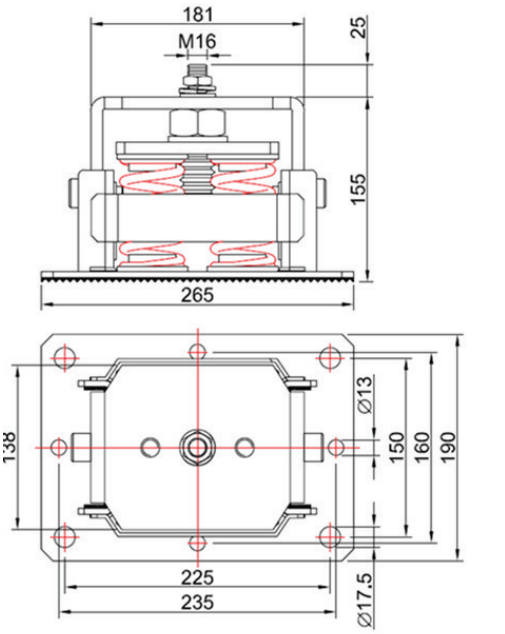
Upper pad: Thermoplastic elastomer **TPV 80shA**, coloured depending on the hardness of the inner elastic body:

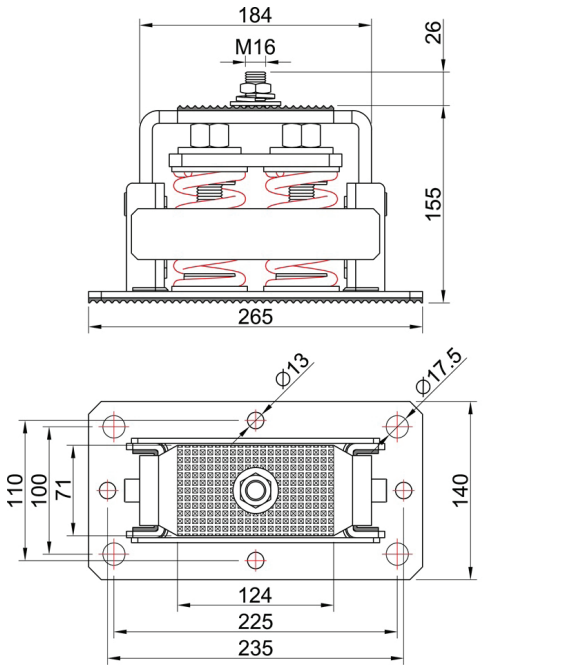
- 45shA **Beige**
- 60shA **Red**
- 70shA **Black**
- 80shA **Blue**

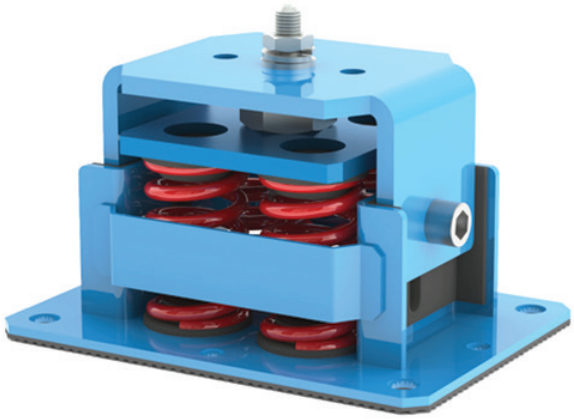
Each kit is complete with stainless steel fixing screws and plain washers for unit assembly.

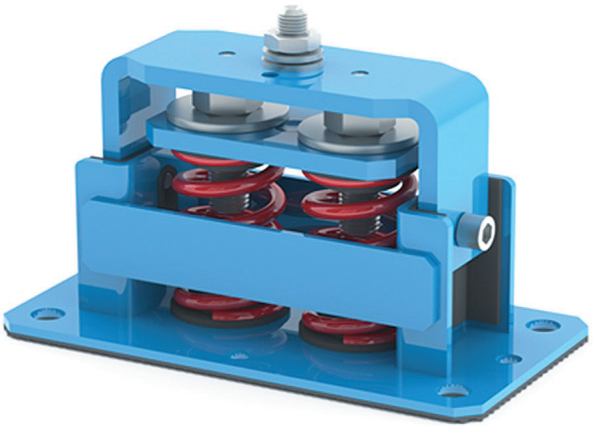
Following in the next page the dimensional and mechanical characteristics of said anti-vibration mounts.

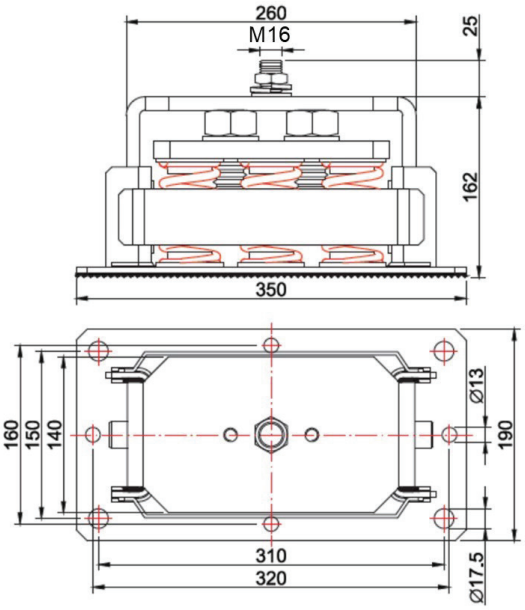
Antivibration mounth with antiseismic structure











- **Spring** in harmonic steel UNI EN 10270 1 SH with surface protected by cataphoretic treatment;
- **8 / 4 nylon disks** lock the spring to the structure and prevent the metal contact;
- **Container structure:** base & upper plates made with S235JR UNI EN 10025 steel sandblasted, protected by cataphoretic treatment and epoxy powder coated:
  - **Base plate** with holes for the anchorage to the floor, welded special profile guides to consent upper plate sliding and barriers to prevent the escape of the spring;
  - **Upper plate** in folded plate 10 mm thick with 2 lateral M16 holes;
- **Fixation to the unit** by Central M16 threaded rod in stainless steel AISI304;
- **Intermediate plate** in sandblasted steel, protected by cataphoretic treatment and coated with epoxy powder;
- **Rod and nut M30 / M20** positioned under the upper plate, to control the level of the machine;
- **2 elastomer guide profiles** inside the steel guide, to prevent the metal contact and assure insulation continuity even with transversal thrusts;
- **Neoprene pad** placed under the base plate with deformable reliefs surface permits to the loaded antivibration mount to stand for friction;
- **2 lateral M16 / M12 screws** to block the lid to the base and prevent spring displacement.

6. Technical Data and Performances

6.1 Refrigerating System

Table 1 – Refrigerating System – models

Model	*H4/*H3 065	*H4/*H3 075	*H4/*H3 080	*H4/*H3 090	*H4/*H3 100	*H4/*H3 110
Number of refrigerant circuits	2	2	2	2	2	2
Refrigerant charge R134a (C1/C2) [kg]	42/41	42/41	54/48	54/48	61/56	61/56
Refrigerant charge R513A (C1/C2) [kg]	46/45	46/45	59/53	59/53	67/62	67/62
Oil charge (C1/C2) [dm³]	22/22	22/22	19/19	19/19	19/30	30/30

Model	*H4/*H3 125	*H4/*H3 140	*H4/*H3 165	*H4/*H3 180	*H4/*H3 195
Number of refrigerant circuits	2	2	2	2	2
Refrigerant charge R134a (C1/C2) [kg]	75/65	75/65	81/73	89/81	89/81
Refrigerant charge R513A (C1/C2) [kg]	83/72	83/72	89/80	98/89	98/89
Oil charge (C1/C2) [dm³]	30/30	30/30	30/30	32/32	32/32

Table 2 – Refrigerating System – models

Model	*IZ 065	*IZ 075	*IZ 080	*IZ 085	*IZ 095
Number of refrigerant circuits	1	1	2	2	2
Refrigerant charge R1234ze (C1/C2) [kg]	81/-	81/-	52/46	52/46	60/53
Oil charge (C1/C2) [dm³]	35/-	35/-	18/19	18/30	18/30

Model	*IZ 110	*IZ 125	*IZ 140	*IZ 150
Number of refrigerant circuits	2	2	2	2
Refrigerant charge R1234ze (C1/C2) [kg]	60/53	73/62	79/70	86/77
Oil charge (C1/C2) [dm³]	35/30	35/30	35/32	35/32

6.2 Water System

Flow conditions

The permitted water flow rate is indicated in the *6.3 Operating limits*. Higher flow values can cause erosion and vibrations inside the tube bundle heat exchanger.

The minimum allowed water flow corresponds to a maximum thermal variation of about 8°C for S (standard delta T) version, about 12°C for H (high delta T) version. More severe operating conditions can cause the action of the safety devices that block the unit.

The maximum return water temperature with a fully loaded unit is 32°C; higher return temperatures are allowed only at start-up.

Glycol limits

The maximum percentage of glycol allowed is 50% (35% with pump groups). The minimum percentage of glycol required depends on the minimum ambient air temperature conditions relating to the installation site.

Hydraulic pressure limits

The maximum hydraulic operating pressure is 10 barg: consider that this limit does not depend on the presence / absence of pumps mounted on the unit, therefore it is necessary to check the maximum static head of the pump (indicated on the pump plate) and that the circuit water is never pressurized to more than 10 barg-maximum static head of the pump.

NOTE: *The safety valve is set to 6 barg, optional.*

Note 1	*Higher flow rate may cause corrosion and vibrations of shells and tubes.*
Note 2	*If the water flow rate is too low, then safety devices lock the unit because the heat exchange is too low. Make sure that the water flow rate is compatible with the values given in Table 3 and Table 4.*
Note 3	*These limits apply to new machines, subject to correct installation and maintenance.*
Note 4	*The maximum allowed water return temperature, when the unit is in full operation, is:* - *32°C for all models.* *Higher return temperatures are allowed only during start-up.*

Table 3 – Water System – models

Model/Version	Min fluid flow [m³/h]	Max fluid flow [m³/h]
*H4/*H3 065 SG0	50	150
*H4/*H3 075 SG0	50	150
*H4/*H3 080 SG0	60	185
*H4/*H3 090 SG0	60	185
*H4/*H3 100 SG0	70	190
*H4/*H3 110 SG0	75	220
*H4/*H3 125 SG0	75	220
*H4/*H3 140 SG0	95	300
*IZ 065 SG0	50	150
*IZ 075 SG0	50	150
*IZ 080 SG0	60	185
*IZ 085 SG0	60	185
*IZ 095 SG0	70	190
*IZ 110 SG0	75	220
*IZ 125 SG0	75	230
*H4/*H3 065 HG0	38	100
*H4/*H3 075 HG0	38	100
*H4/*H3 080 HG0	45	110
*H4/*H3 090 HG0	50	120
*H4/*H3 100 HG0	50	130
*H4/*H3 110 HG0	55	155
*H4/*H3 125 HG0	60	180
*H4/*H3 140 HG0	65	180
*H4/*H3 165 HG0	80	220
*H4/*H3 180 HG0	85	260
*H4/*H3 195 HG0	90	320
*IZ 065 HG0	38	100
*IZ 075 HG0	38	100
*IZ 080 HG0	45	110
*IZ 085 HG0	45	110
*IZ 095 HG0	50	130
*IZ 110 HG0	50	150
*IZ 125 HG0	60	180
*IZ 140 HG0	65	220
*IZ 150 HG0	70	220

Table 4 – Water System – AFC models

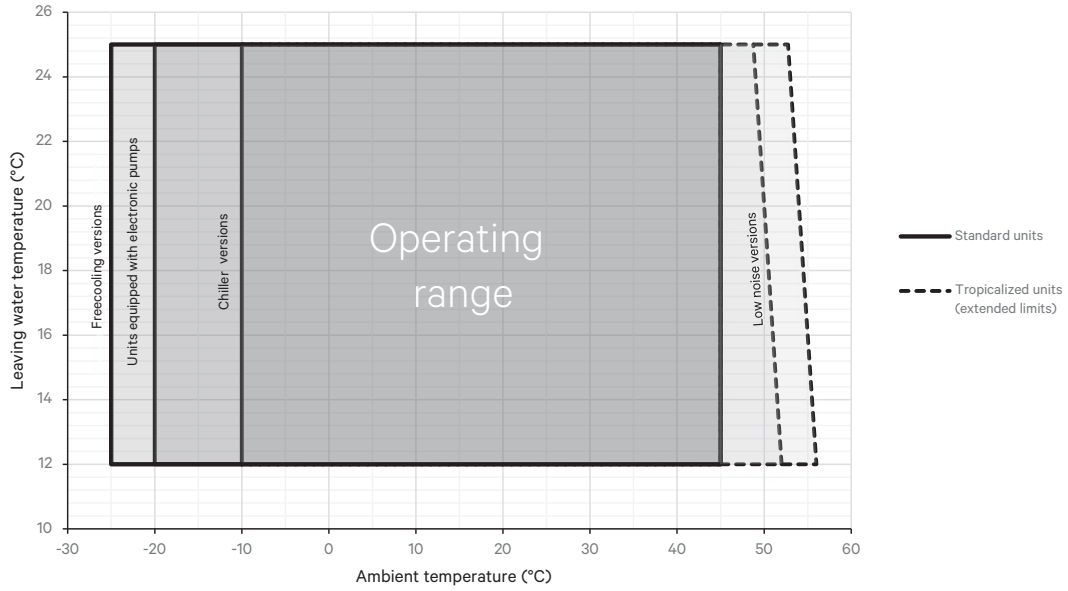
Models	CIZ 065-075 CH4/CH3 065-075	CIZ 080-085 CH4/CH3 080-090	CIZ 095-110 CH4/CH3 100-110	CIZ 125 CH4/CH3 125-140	CIZ 140 CH4/CH3 165	CIZ 150 CH4/CH3 180-195
Internal hydraulic volume (Chiller versions)						
User side (dm³)	354	334	936	978	1083	1043

Models	FIZ 065-075 FH4/FH3 065-075	FIZ 080-085 FH4/FH3 080-090	FIZ 095-110 FH4/FH3 100-110	FIZ 125 FH4/FH3 125-140	FIZ 140 FH4/FH3 165	FIZ 150 FH4/FH3 180-195
Internal hydraulic volume (Freecooling versions)						
User side (dm³)	768	827	1585	1709	1894	1937

Models	NIZ 065-075 NH4/NH3 065-075	NIZ 080-085 NH4/NH3 080-090	NIZ 095-110 NH4/NH3 100-110	NIZ 125 NH4/NH3 125-140	NIZ 140 NH4/NH3 165	NIZ 150 NH4/NH3 180-195
Internal hydraulic volume (Glycol-free versions)						
User side (dm³)	456	460	1144	1218	1418	1427
Glycol circuit (dm³)	499	599	759	894	1066	1189
Hydraulic Connection						
Evaporator connection	DN125 5”	DN125 5”	DN 150 6"	DN 150 6"	DN 150 6"	DN 150 6"
Grooved pipes connections	139,7 mm	139,7 mm	168.3 mm	168,3 mm	168,3 mm	168,3 mm

6.3 Operating Limits

The following graph is a generic indication of the operating limits of the **Liebert®AFC** range:.



NOTICE

The maximum ambient temperature for all **Liebert®AFC** units is 45°C. To extend the operating range above this threshold please contact **Vertiv™** or its representative: the unit in that case may require some design changes (tropicalized version).

NOTICE

Some configurable options like low noise, quiet or adiabatic versions may affect the extended limits of **Liebert®AFC** units. Please contact **Vertiv™** or its representative for detailed information.

Refer to the following tables for the extended ambient limits related to the specific **Liebert®AFC** models, in tropicalized version. This must be intended as an ultimate physical limit referring to rejection capacity of the condenser at the **HP** switch threshold, not considering intermediate protection functions normally active in the standard **Vertiv™** controller.

Table 5 – Models: CH4/CH3***SG0

Models: CH4/CH3***SG0		065 SG0	075 SG0	080 SG0	090 SG0	100 SG0	110 SG0	125 SG0	140 SG0
Operating range									
Maximum air inlet temperature (1)	°C	56			55				53
Minimum air inlet temperature	°C	-10							
Maximum leaving water temperature	°C	25							
Minimum leaving water temperature	°C	12							
Min fluid flow	m³/h	50		60		70	75		95
Max fluid flow	m³/h	150		185		190	220		300
Safety devices settings									
High pressure switch set	barg	20							
High pressure safety valve set	barg	22							
HP safety valve (each circuit)	#	1				2			
High pressure safety valve connection	inch	1 1/4" G							
Low pressure switch	barg	0,5							
Low pressure safety valve set	barg	14							
LP safety valve (each circuit)	#	1							
Low pressure safety valve connection	inch	3/4" G							

(1) – Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 6 – Models: CH4/CH3***HG0

Models: CH4/CH3***HG0		065 HG0	075 HG0	080 HG0	090 HG0	100 HG0	110 HG0	125 HG0	140 HG0	165 HG0	180 HG0	195 HG0
Operating range												
Maximum air inlet temperature (1)	°C	57	56		55				52			46
Minimum air inlet temperature	°C	-10										
Maximum leaving water temperature	°C	25										
Minimum leaving water temperature	°C	12										
Min fluid flow	m³/h	38		45	50		55	60	65	80	85	90
Max fluid flow	m³/h	100		110	120	130	155	180		220	260	320
Safety devices settings												
High pressure switch set	barg	20										18
High pressure safety valve set	barg	22										
HP safety valve (each circuit)	#	1				2						3
High pressure safety valve connection	inch	1 1/4" G										
Low pressure switch	barg	0,5										
Low pressure safety valve set	barg	14										
LP safety valve (each circuit)	#	1										
Low pressure safety valve connection	inch	3/4" G								1" G		

(1) – Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 7 – Models: CIZ***SG0

Models: CIZ***SG0		065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0
Operating range								
Maximum air inlet temperature (1)	°C	56	55	56	55	56	53	53
Minimum air inlet temperature	°C	-10						
Maximum leaving water temperature	°C	25						
Minimum leaving water temperature	°C	12						
Min fluid flow	m³/h	50		60		70	75	
Max fluid flow	m³/h	150		185		220	220	
Safety devices settings								
High pressure switch set	barg	18						
High pressure safety valve set	barg	22						
HP safety valve (each circuit)	#	1			2			
High pressure safety valve connection	inch	1 1/4" G						
Low pressure switch	barg	0,0						
Low pressure safety valve set	barg	14						
LP safety valve (each circuit)	#	1						
Low pressure safety valve connection	inch	3/4" G						

(1) – Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 8 – Models: CIZ***HG0

Models: CIZ***HG0E		065 HG0	075 HG0	080 HG0	085 HG0	095 HG0	110 HG0	125 HG0	140 HG0	150 HG0
Operating range										
Maximum air inlet temperature (1)	°C	56	54	56	54	54	53		53	
Minimum air inlet temperature	°C	-10								
Maximum leaving water temperature	°C	25								
Minimum leaving water temperature	°C	12								
Min fluid flow	m³/h	38		45		50		60	65	70
Max fluid flow	m³/h	100		110		130	150	180	220	
Safety devices settings										
High pressure switch set	barg	18								
High pressure safety valve set	barg	22								
HP safety valve (each circuit)	#	1			2					
High pressure safety valve connection	inch	1 1/4" G								
Low pressure switch	barg	0,0								
Low pressure safety valve set	barg	14								
LP safety valve (each circuit)	#	1								
Low pressure safety valve connection	inch	3/4" G							1" G	

(1) – Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 9 – Models: FH4/FH3***SG0

Models: FH4/FH3***SG0		065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0	140 HG0
Operating range									
Maximum air inlet temperature (1)	°C	56	55		54	54	54	54	52
Minimum air inlet temperature	°C	-25							
Maximum leaving water temperature	°C	25							
Minimum leaving water temperature	°C	12							
Min fluid flow	m³/h	50		60		70	75		95
Max fluid flow	m³/h	150		185		190	220		300
Safety devices settings									
High pressure switch set	barg	20							
High pressure safety valve set	barg	22							
HP safety valve (each circuit)	#	1				2			
High pressure safety valve connection	inch	1 1/4" G							
Low pressure switch	barg	0,5							
Low pressure safety valve set	barg	14							
LP safety valve (each circuit)	#	1							
Low pressure safety valve connection	inch	3/4" G							

(1) - Extended limit @ nominal air flow; 30%Eth.glycol outlet temperature 20°C; full load

Table10 – Models: FH4/FH3***HG0

Models: FH4/FH3***HG0		065 HG0	075 HG0	080 HG0	090 HG0	100 HG0	110 HG0	125 HG0	140 HG0	165 HG0	180 HG0	195 HG0
Operating range												
Maximum air inlet temperature (1)	°C	56	54	55	53	54			51			44
Minimum air inlet temperature	°C	-25										
Maximum leaving water temperature	°C	25										
Minimum leaving water temperature	°C	12										
Min fluid flow	m³/h	38		45		50	55	60	65	80	85	90
Max fluid flow	m³/h	100		110	120	130	155	180		220	260	320
Safety devices settings												
High pressure switch set	barg	20										18
High pressure safety valve set	barg	22										
HP safety valve (each circuit)	#	1				2						3
High pressure safety valve connection	inch	1 1/4" G										
Low pressure switch	barg	0,5										
Low pressure safety valve set	barg	14										
LP safety valve (each circuit)	#	1										
Low pressure safety valve connection	inch	3/4" G								1" G		

(1) - Extended limit @ nominal air flow; 30%Eth.glycol outlet temperature 20°C; full load

Table 11 – Models: FIZ***SG0

Models: FIZ***SG0		065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0
Operating range								
Maximum air inlet temperature (1)	°C	55	53	55	54	55	52	
Minimum air inlet temperature	°C	-25						
Maximum leaving water temperature	°C	25						
Minimum leaving water temperature	°C	12						
Min fluid flow	m³/h	50		60		70	75	
Max fluid flow	m³/h	150		185		220	220	
Safety devices settings								
High pressure switch set	barg	18						
High pressure safety valve set	barg	22						
HP safety valve (each circuit)	#	1			2			
High pressure safety valve connection	inch	1 1/4" G						
Low pressure switch	barg	0,0						
Low pressure safety valve set	barg	14						
LP safety valve (each circuit)	#	1						
Low pressure safety valve connection	inch	3/4" G						

(1) - Extended limit @ nominal air flow; 30%Eth.glycol outlet temperature 20°C; full load

Table 12 – Models: FIZ***HG0

Models: FIZ***HG0		065 HG0	075 HG0	080 HG0	085 HG0	095 HG0	110 HG0	125 HG0	140 HG0	150 HG0
Operating range										
Maximum air inlet temperature (1)	°C	55	53	55	53	55	52		53	52
Minimum air inlet temperature	°C	-25								
Maximum leaving water temperature	°C	25								
Minimum leaving water temperature	°C	12								
Min fluid flow	m³/h	38		45		50		60	65	70
Max fluid flow	m³/h	100		110		130	150	180	220	
Safety devices settings										
High pressure switch set	barg	18								
High pressure safety valve set	barg	22								
HP safety valve (each circuit)	#	1			2					
High pressure safety valve connection	inch	1 1/4" G								
Low pressure switch	barg	0,0								
Low pressure safety valve set	barg	14								
LP safety valve (each circuit)	#	1								
Low pressure safety valve connection	inch	3/4" G							1" G	

(1) - Extended limit @ nominal air flow; 30%Eth.glycol outlet temperature 20°C; full load

Table 13 – Models: NH4/NH3***SG0

Models: NH4/NH3***SG0		065 SG0	075 SG0	080 SG0	090 SG0	100 SG0	110 SG0	125 SG0	140 SG0
Operating range									
Maximum air inlet temperature (1)	°C	56	54	55	53	54		53	51
Minimum air inlet temperature	°C	-25							
Maximum leaving water temperature	°C	25							
Minimum leaving water temperature	°C	12							
Min fluid flow	m³/h	50		60		70	75		95
Max fluid flow	m³/h	150		185		190	220		300
Safety devices settings									
High pressure switch set	barg	20							
High pressure safety valve set	barg	22							
HP safety valve (each circuit)	#	1				2			
High pressure safety valve connection	inch	1 1/4" G							
Low pressure switch	barg	0,5							
Low pressure safety valve set	barg	14							
LP safety valve (each circuit)	#	1							
Low pressure safety valve connection	inch	3/4" G							

(1) - Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 14 – Models: NH4/NH3***HG0

Models: NH4/NH3***HG0		065 HG0	075 HG0	080 HG0	090 HG0	100 HG0	110 HG0	125 HG0	140 HG0	165 HG0	180 HG0	195 HG0
Operating range												
Maximum air inlet temperature (1)	°C	56	54	55	53	54		53		51		44
Minimum air inlet temperature	°C	-20										
Maximum leaving water temperature	°C	25										
Minimum leaving water temperature	°C	12										
Min fluid flow	m³/h	38		45	50		55	60	65	80	85	90
Max fluid flow	m³/h	100		110	120	130	155	180		220	260	320
Safety devices settings												
High pressure switch set	barg	20										18
High pressure safety valve set	barg	22										
HP safety valve (each circuit)	#	1				2						3
High pressure safety valve connection	inch	1 1/4" G										
Low pressure switch	barg	0,5										
Low pressure safety valve set	barg	14										
LP safety valve (each circuit)	#	1										
Low pressure safety valve connection	inch	3/4" G								1" G		

(1) - Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 15 – Models: NIZ***SG0

Models: NIZ***SG0		065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0
Operating range								
Maximum air inlet temperature (1)	°C	55	53	55	54	55	52	
Minimum air inlet temperature	°C	-20						
Maximum leaving water temperature	°C	25						
Minimum leaving water temperature	°C	12						
Min fluid flow	m³/h	50		60		70	75	
Max fluid flow	m³/h	150		185		220	220	
Safety devices settings								
High pressure switch set	barg	18						
High pressure safety valve set	barg	22						
HP safety valve (each circuit)	#	1			2			
High pressure safety valve connection	inch	1 1/4" G						
Low pressure switch	barg	0,0						
Low pressure safety valve set	barg	14						
LP safety valve (each circuit)	#	1						
Low pressure safety valve connection	inch	3/4" G						

(1) - Extended limit @ nominal air flow; water outlet temperature 20°C; full load

Table 16 – Models: NIZ***HG0

Models: NIZ***HG0		065 HG0	075 HG0	080 HG0	085 HG0	095 HG0	110 HG0	125 HG0	140 HG0	150 HG0
Operating range										
Maximum air inlet temperature (1)	°C	55	53	55	53	55	52			
Minimum air inlet temperature	°C	-20								
Maximum leaving water temperature	°C	25								
Minimum leaving water temperature	°C	12								
Min fluid flow	m³/h	38		45		50		60	65	70
Max fluid flow	m³/h	100		110		130	150	180	220	
Safety devices settings										
High pressure switch set	barg	18								
High pressure safety valve set	barg	22								
HP safety valve (each circuit)	#	1			2					
High pressure safety valve connection	inch	1 1/4" G								
Low pressure switch	barg	0,0								
Low pressure safety valve set	barg	14								
LP safety valve (each circuit)	#	1								
Low pressure safety valve connection	inch	3/4" G							1" G	

(1) - Extended limit @ nominal air flow; water outlet temperature 20°C; full load

6.4 Electrical System

Table 17 – Electrical Data - NH4*SG0 Models**

Models NH4***SG0		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input (2)	kW	155	189	210	240	256	273	316	357
OA (without PFC) (2)	A	271	321	349	420	438	459	523	592
cosφ (without PFC) (2)	-	0,83	0,85	0,87	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,94
Rated power									
FLA	A	480	540	577	677	747	807	916	976
Max. power input	kW	238	268	302	334	355	370	426	473
OAmax	A	391	437	491	557	586	601	690	766
cosφ (without PFC)		0,88	0,89	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	362	408	463	529	537	562	656	764
cosφ (with PFC)		0,95	0,95	0,94	0,91	0,96	0,95	0,94	0,89
LRA	A	832	908	1005	1066	1093	922	1034	1227
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm² per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	132	157	172	201	211	228	265	306
Nominal current	A	234	272	290	361	369	390	445	514
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps									
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161

Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	184	221	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/161	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	20,1	23,4	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	31,5	38,0	38,0
LRA	A	136	184	184	221	221	221	274	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/161	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	21,6	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	34,0	39,9	39,9
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,6	21,6
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0

(1) Nominal conditions: water inlet/outlet temperatures 26/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.) :

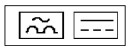


Table 18 – Electrical Data - NH4***SG0 Low Noise Models

Models NH4***SG0L		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input	kW	153	180	199	232	243	262	303	353
OA (without PFC)	A	265	308	331	407	418	442	504	585
cosφ (without PFC)	-	0,83	0,84	0,87	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC)	-	0,95	0,94	0,94	0,95	0,94	0,93	0,93	0,95
Rated power									
FLA	A	484	544	582	682	753	813	923	983
Max. power input	kW	240	270	305	336	358	373	429	476
OAmax	A	394	440	496	562	590	607	695	771
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	366	412	468	535	542	568	663	771
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,89
LRA	A	832	908	1008	1069	1097	926	1039	1232
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm² per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30

LRA	A	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	141	168	184	217	226	246	284	334
Nominal current	A	246	289	308	384	391	415	474	555
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps									
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	184	221	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/161	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	20,1	23,4	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	31,5	38,0	38,0
LRA	A	136	184	184	221	221	221	274	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/161	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	21,6	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	34,0	39,9	39,9
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,6	21,6
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0

(1) Nominal conditions: water inlet/outlet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

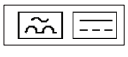


Table 19 – Electrical Data - CH4***SG0 Models

Models CH4***SG0		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input (2)	kW	160	182	204	232	248	264	306	344
OA (without PFC) (2)	A	276	312	339	408	426	445	509	574
cosφ (without PFC) (2)	-	0,83	0,84	0,87	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95
Rated power									
FLA	A	480	540	577	677	747	807	916	976
Max. power input	kW	238	268	302	334	355	370	426	473
OAmax	A	389	435	491	557	584	601	688	764
cosφ (without PFC)		0,88	0,89	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	362	408	463	529	537	562	656	764
cosφ (with PFC)		0,95	0,95	0,94	0,91	0,96	0,95	0,94	0,89
LRA	A	832	908	1005	1066	1093	922	1034	1227
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm² per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	130	152	168	196	206	222	258	296
Nominal current	A	230	266	284	353	362	381	435	500
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input (2)	kW	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Nominal current (2)	A	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps									
Std. head pump model	-	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/151	NB80-160/151
Nominal power	kW	5,5	5,5	7,5	11,0	11,0	11,0	15,0	15,0
Motor power	kW	6,1	6,1	8,4	12,1	12,1	12,1	16,4	16,4
Max. current	A	11,2	11,2	15,2	19,4	19,4	19,4	26,3	26,3

LRA	A	131	131	169	136	136	136	184	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	184	221	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,6	12,4	12,4	17,7	17,5	17,5	21,6	21,6
Max. current	A	13,4	19,3	19,3	26,6	28,0	28,0	0,0	34,0

(1) Nominal conditions: 30%eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

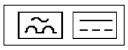


Table 20 – Electrical Data - CH4*SG0 Low Noise Models**

Models CH4***SG0L		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input	kW	148	174	192	223	234	253	293	339
OA (without PFC)	A	258	298	320	393	405	427	487	563
cosφ (without PFC)	-	0,83	0,84	0,86	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95
Rated power									
FLA	A	484	544	582	682	753	813	923	983
Max. power input	kW	240	270	305	336	358	373	429	476
OAmax	A	394	440	496	562	590	607	695	771
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	366	412	468	535	542	568	663	771
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,89
LRA	A	832	908	1008	1069	1097	926	1039	1232
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm² per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	137	163	179	210	219	238	275	321
Nominal current	A	241	281	300	373	381	403	460	536
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1

Nominal current	A	1,7	1,7	1,7	1,7	1,7	1,7	1,7	1,7
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps									
Std. head pump model	-	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/151	NB80-160/151
Nominal power	kW	5,5	5,5	7,5	11,0	11,0	11,0	15,0	15,0
Motor power	kW	6,1	6,1	8,4	12,1	12,1	12,1	16,4	16,4
Max. current	A	11,2	11,2	15,2	19,4	19,4	19,4	26,3	26,3
LRA	A	131	131	169	136	136	136	184	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	184	221	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	8,6	12,4	12,4	17,7	17,5	17,5	21,6	21,6
Max. current	A	13,4	19,3	19,3	26,6	28,0	28,0	34,0	34,0

(1) Nominal conditions: water inlet/outlet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

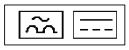


Table 21 – Electrical Data - FH4*SG0 Models**

Models FH4***SG0		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input (2)	kW	163	187	209	238	254	271	314	355
OA (without PFC) (2)	A	281	319	347	417	436	456	520	588
cosφ (without PFC) (2)	-	0,84	0,85	0,87	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95
Rated power									
FLA	A	480	540	577	677	747	807	916	976
Max. power input	kW	238	268	302	334	355	370	426	473
OAmax	A	389	435	491	557	584	601	688	764
cosφ (without PFC)		0,88	0,89	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	362	408	463	529	537	562	656	764
cosφ (with PFC)		0,95	0,95	0,94	0,91	0,96	0,95	0,94	0,89
LRA	A	832	908	1005	1066	1093	922	1034	1227
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	131	155	170	199	209	227	263	303
Nominal current	A	232	270	288	358	367	387	442	510
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450

Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps									
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	8,4	12,1	12,1	16,4	16,4	20,1	20,1	23,4
Max. current	A	15,2	19,4	19,4	26,3	26,3	31,5	31,5	38,0
LRA	A	169	136	136	184	184	221	221	274
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/167	NB80-160/167	NB80-160/177
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0	30,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	23,4	23,4	32,1
Max. current	A	19,4	26,3	26,3	31,5	31,5	38,0	38,0	52,0
LRA	A	136	184	184	221	221	274	274	364
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	25,2	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C .
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

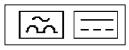


Table 22 – Electrical Data - FH4*SG0 Low Noise Models**

Models FH4***SG0L		065	075	080	090	100	110	125	140
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz							
Operating (1)									
Total power input	kW	152	178	197	229	241	260	301	350
OA (without PFC)	A	263	305	328	403	415	438	500	580
cosφ (without PFC)	-	0,83	0,84	0,87	0,82	0,84	0,86	0,87	0,87
cosφ (with PFC)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95
Rated power									
FLA	A	484	544	582	682	753	813	923	983
Max. power input	kW	240	270	305	336	358	373	429	476
OAmax	A	394	440	496	562	590	607	695	771
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89
OAmax (with PFC)	A	366	412	468	535	542	568	663	771
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,89
LRA	A	832	908	1008	1069	1097	926	1039	1232
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²per phase	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²
Control									
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz							
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7

Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2
Compressors									
Power input	kW	140	166	182	215	224	243	282	330
Nominal current	A	244	286	305	380	388	411	470	550
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD
Fans									
Fans number	-	10	10	12	12	14	14	16	16
Power input (2)	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current (2)	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current (2)	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps									
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	8,4	12,1	12,1	16,4	16,4	20,1	20,1	23,4
Max. current	A	15,2	19,4	19,4	26,3	26,3	31,5	31,5	38,0
LRA	A	169	136	136	184	184	221	221	274
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/167	NB80-160/167	NB80-160/177
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0	30,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	23,4	23,4	32,1
Max. current	A	19,4	26,3	26,3	31,5	31,5	38,0	38,0	52,0
LRA	A	136	184	184	221	221	274	274	364
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	25,2	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

Table 23 – Electrical Data - NIZ*SG0 Models**

Models NIZ***SG0		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input (2)	kW	160	186	192	214	238	280	315
OA (without PFC) (2)	A	259	301	321	352	385	463	516
cosφ (without PFC) (2)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88
Rated power								
FLI	A	469	539	533	679	719	809	858
Max. power input	kW	265	304	291	347	371	438	465
FLA	A	422	489	474	557	591	704	746
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,90	0,90	0,90
LRA	A	88	88	956	795	834	1028	1101
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM

Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	128	154	153	176	193	235	264
Nominal current	A	210	252	262	293	316	394	438
Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD
Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps								
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5
LRA	A	169	136	136	184	184	184	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	20,1	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	31,5	38,0
LRA	A	136	184	184	221	221	221	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/161	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	21,6	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	34,0	39,9
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,6
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40 °C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

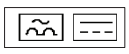


Table 24 – Electrical Data - NIZ***SG0 Low Noise Models

Models NIZ***SG0L		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input	kW	154	182	181	208	226	277	312
OA (without PFC)	A	249	296	305	343	369	459	510
cosφ (without PFC)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88
Rated power								
FLI	A	472	542	536	682	723	813	863
Max. power input	kW	267	306	293	350	374	440	468
FLA	A	425	492	477	560	595	708	751
cosφ (without PFC)		0,90	0,90	0,89	0,89	0,90	0,90	0,90
LRA	A	91	91	959	798	838	1032	1106
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	142	170	167	194	210	260	292
Nominal current	A	230	277	282	320	342	432	480
Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD
Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current (2)	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current (2)	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps								
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5
LRA	A	169	136	136	184	184	184	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	20,1	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	31,5	38,0
LRA	A	136	184	184	221	221	221	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/161	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	21,6	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	34,0	39,9

No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,6
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40 °C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

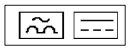


Table 25 – Electrical Data - CIZ*SG0 Models**

Models CIZ***SG0		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input (2)	kW	155	180	185	206	230	269	303
OA (without PFC) (2)	A	250	291	310	340	372	447	500
cosφ (without PFC) (2)	-	0,89	0,89	0,86	0,87	0,89	0,87	0,88
Rated power								
FLI	A	469	539	533	679	719	809	858
Max. power input	kW	265	304	291	347	371	438	465
FLA	A	422	489	474	557	591	704	746
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,90	0,90	0,90
LRA	A	69	69	956	795	834	1028	1101
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	125	150	149	170	188	227	255
Nominal current	A	204	245	255	285	308	383	426
Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD
Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Nominal current (2)	A	4,6	4,6	4,6	4,6	4,6	4,6	4,6
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps								
Std. head pump model	-	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/151
Nominal power	kW	5,5	5,5	7,5	11,0	11,0	11,0	15,0
Motor power	kW	6,1	6,1	8,4	12,1	12,1	12,1	16,4
Max. current	A	11,2	11,2	15,2	19,4	19,4	19,4	26,3

LRA	A	131	131	169	136	136	136	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5
LRA	A	169	136	136	184	184	184	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,6	12,4	12,4	17,7	17,5	17,5	21,6
Max. current	A	13,4	19,3	19,3	26,6	28,0	28,0	34,0

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

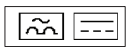


Table 26 – Electrical Data - CIZ*SG0 Low Noise Models**

Models CIZ***SG0L		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input	kW	147	175	174	200	219	265	297
OA (without PFC)	A	240	285	295	331	356	441	491
cosφ (without PFC)	-	0,88	0,89	0,85	0,87	0,89	0,87	0,87
Rated power								
FLI	A	472	542	536	682	723	813	863
Max. power input	kW	267	306	293	350	374	440	468
FLA	A	425	492	477	560	595	708	751
cosφ (without PFC)		0,90	0,90	0,89	0,89	0,90	0,90	0,90
LRA	A	72	72	959	798	838	1032	1106
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	136	164	161	186	203	250	280
Nominal current	A	222	267	273	309	331	416	462
Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD
Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Nominal current (2)	A	1,8	1,8	1,8	1,8	1,8	1,8	1,8
Max. Current (2)	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2

Pumps								
Std. head pump model	-	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/151
Nominal power	kW	5,5	5,5	7,5	11,0	11,0	11,0	15,0
Motor power	kW	6,1	6,1	8,4	12,1	12,1	12,1	16,4
Max. current	A	11,2	11,2	15,2	19,4	19,4	19,4	26,3
LRA	A	131	131	169	136	136	136	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	16,4	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	26,3	31,5
LRA	A	169	136	136	184	184	184	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5
Motor power	kW	8,6	12,4	12,4	17,7	17,5	17,5	21,6
Max. current	A	13,4	19,3	19,3	26,6	28,0	28,0	34,0

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

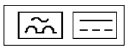


Table 27 – Electrical Data - FIZ*SG0 Models**

Models FIZ***SG0		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input (2)	kW	159	185	191	213	236	278	313
OA (without PFC) (2)	A	258	300	319	350	383	461	513
cosφ (without PFC) (2)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88
Rated power								
FLI	A	469	539	533	679	719	809	858
Max. power input	kW	265	304	291	347	371	438	465
FLA	A	422	489	474	557	591	704	746
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,90	0,90	0,90
LRA	A	69	69	956	795	834	1028	1101
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	127	153	152	175	191	233	262
Nominal current	A	209	251	260	291	314	392	435
Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD

Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps								
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	221	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	23,4	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	38,0	38,0
LRA	A	136	184	184	221	221	274	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

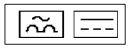


Table 28 – Electrical Data - FIZ*SG0 Low Noise Models**

Models FIZ***SG0L		065	075	080	085	095	110	125
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Operating (1)								
Total power input	kW	152	181	180	206	225	275	308
OA (without PFC)	A	247	294	303	340	366	455	506
cosφ (without PFC)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88
Rated power								
FLI	A	472	542	536	682	723	813	863
Max. power input	kW	267	306	293	350	374	440	468
FLA	A	425	492	477	560	595	708	751
cosφ (without PFC)		0,90	0,90	0,89	0,89	0,90	0,90	0,90
LRA	A	72	72	959	798	838	1032	1106
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²
Control								
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz						
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2
Compressors								
Power input	kW	140	169	166	192	208	258	289
Nominal current	A	228	275	280	317	339	428	476

Single compressor 1 - FLA	A	374	440	232	300	300	374	374
Single compressor 1 - FLI	A	420	490	260	340	340	420	420
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295
Single compressor 2 - FLI	A			214	280	310	320	360
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD
Fans								
Fans number	-	10	10	12	12	14	14	16
Power input (2)	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current (2)	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current (2)	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps								
Std. head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	15,0	15,0	18,5	18,5
Motor power	kW	8,4	12,1	12,1	16,4	16,4	20,1	20,1
Max. current	A	15,2	19,4	19,4	26,3	26,3	31,5	31,5
LRA	A	169	136	136	184	184	221	221
High head pump model	-	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/161	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0
Motor power	kW	12,1	16,4	16,4	20,0	20,1	23,4	23,4
Max. current	A	19,4	26,3	26,3	31,5	31,5	38,0	38,0
LRA	A	136	184	184	221	221	274	274
Inverter pump model	-	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/161	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0
Motor power	kW	12,4	17,7	17,7	21,4	21,6	25,2	25,2
Max. current	A	19,3	26,6	26,6	32,3	34,0	39,9	39,9
LRA	A	19	27	27	32	34	40	40

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 26/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

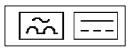


Table 29 – Electrical Data - NH4*HG0 Models**

Models NH4***HG0		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input (2)	kW	166	190	212	241	258	276	318	361	410	485	523
OA (without PFC) (2)	A	285	323	352	422	442	463	527	597	670	794	851
cosφ (without PFC) (2)	-	0,84	0,85	0,87	0,83	0,84	0,86	0,87	0,87	0,88	0,88	0,89
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94
Rated power												
FLI	A	481	541	579	679	749	809	918	978	988	1230	1118
Max. power input	kW	238	268	302	334	355	370	426	473	536	640	592
FLA	A	391	437	493	559	586	603	690	766	860	1032	956
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	363	409	464	531	538	563	658	734	815	984	908
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,93	0,95	0,94	0,94
LRA	A	832	908	1005	1066	1093	922	1034	1227	1279	1482	1444
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz										

Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	'1,5/35	'1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	134	158	174	203	213	231	267	310	352	421	459
Nominal current	A	236	274	293	363	373	394	449	519	582	696	753
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,9	4,9	4,9
Pumps												
Std. head pump model	-	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/151	NB80-160/147	NB80-160/151	NB80-160/151
Nominal power	kW	4,0	5,5	5,5	5,5	5,5	7,5	11,0	15,0	11,0	15,0	15,0
Motor power	kW	4,5	6,1	6,1	6,1	6,1	8,4	12,1	16,4	12,1	16,4	16,4
Max. current	A	8,0	11,2	11,2	11,2	11,2	15,2	19,4	26,3	19,4	26,3	26,3
LRA	A	98	131	131	131	131	169	136	184	136	184	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/161	NB80-160/161	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	18,5	18,5	18,5	18,5
Motor power	kW	8,4	12,1	12,1	12,1	12,1	12,1	16,4	20,1	20,1	20,1	20,1
Max. current	A	15,2	19,4	19,4	19,4	19,4	19,4	26,3	31,5	31,5	31,5	31,5
LRA	A	169	136	136	136	136	136	184	221	221	221	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/161	NBE80-160/161	NBE80-160/161	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	18,5	18,5	18,5	18,5
Motor power	kW	8,6	12,4	12,4	21,4	12,4	12,4	17,7	21,7	21,7	21,7	21,7
Max. current	A	13,4	19,3	19,3	19,3	19,3	19,3	26,6	34,0	34,0	34,0	34,0
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161	NBE 100-160/160-154	NBE 100-160/167	NBE 100-160/167
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,7	21,7	21,7	25,2	25,2
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0	34,0	39,9	39,9

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

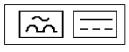


Table 30 – Electrical Data - NH4*HG0 Low Noise Models**

Models NH4***HG0L		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input (2)	kW	155	182	200	234	246	266	307	358	408	481	525
OA (without PFC) (2)	A	268	311	335	410	423	447	509	592	666	788	855
cosφ (without PFC) (2)	-	0,83	0,84	0,86	0,83	0,84	0,86	0,87	0,87	0,88	0,88	0,89
cosφ (with PFC) (2)	-	0,95	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94

Rated power												
FLI	A	484	544	582	682	753	813	923	983	994	1236	1124
Max. power input	kW	240	270	305	336	358	373	429	476	539	644	596
FLA	A	394	440	496	562	590	607	695	771	866	1038	962
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	366	412	468	535	542	568	663	738	820	990	915
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,93	0,95	0,94	0,94
LRA	A	835	911	1008	1069	1097	926	1039	1232	1285	1488	1450
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/ Hz	230V / 1Ph + N + PE / 50Hz										
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	143	170	186	220	229	249	288	339	386	457	501
Nominal current	A	249	292	312	387	396	420	479	562	632	750	817
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps												
Std. head pump model	-	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/151	NB80-160/147	NB80-160/151	NB80-160/151
Nominal power	kW	4,0	5,5	5,5	5,5	5,5	7,5	11,0	15,0	11,0	15,0	15,0
Motor power	kW	4,5	6,1	6,1	6,1	6,1	8,4	12,1	16,4	12,1	16,4	16,4
Max. current	A	8,0	11,2	11,2	11,2	11,2	15,2	19,4	26,3	19,4	26,3	26,3
LRA	A	98	131	131	131	131	169	136	184	136	184	184
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/161	NB80-160/161	NB80-160/161	NB80-160/161
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	18,5	18,5	18,5	18,5
Motor power	kW	8,4	12,1	12,1	12,1	12,1	12,1	16,4	20,1	20,1	20,1	20,1
Max. current	A	15,2	19,4	19,4	19,4	19,4	19,4	26,3	31,5	31,5	31,5	31,5
LRA	A	169	136	136	136	136	136	184	221	221	221	221
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/161	NBE80-160/161	NBE80-160/161	NBE80-160/161
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	18,5	18,5	18,5	18,5
Motor power	kW	8,6	12,4	12,4	12,4	12,4	12,4	17,7	21,7	21,7	21,7	21,7
Max. current	A	13,4	19,3	19,3	19,3	19,3	19,3	26,6	34,0	34,0	34,0	34,0
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161	NBE 100-160/160-154	NBE 100-160/167	NBE 100-160/167
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0

Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,7	21,7	21,7	25,2	25,2
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0	34,0	39,9	39,9

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

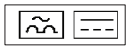


Table 31 – Electrical Data - CH4*HG0 Models**

Models CH4***HG0		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input (2)	kW	161	184	206	234	250	267	309	348	396	470	505
OA (without PFC) (2)	A	278	315	342	411	430	450	514	580	650	771	825
cosφ (without PFC) (2)	-	0,84	0,84	0,87	0,82	0,84	0,86	0,87	0,87	0,88	0,88	0,88
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94
Rated power												
FLI	A	481	541	579	679	749	809	918	978	988	1230	1118
Max. power input	kW	238	268	302	334	355	370	426	473	536	640	592
FLA	A	391	437	493	559	586	603	690	766	860	1032	956
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	363	409	464	531	538	563	658	734	815	984	908
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,93	0,95	0,94	0,94
LRA	A	832	908	1005	1066	1093	922	1034	1227	1279	1482	1444
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 5075Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz										
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	131	154	170	198	208	225	261	300	342	410	445
Nominal current	A	232	269	287	356	366	386	440	506	567	679	733
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input (2)	kW	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Nominal current (2)	A	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,9	4,9	4,9
Pumps												
Std. head pump model	-	NB65-125/120-110	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/147	NB80-160/151
Nominal power	kW	4,0	4,0	5,5	5,5	5,5	7,5	11,0	11,0	11,0	11,0	15,0
Motor power	kW	4,5	4,5	6,1	6,1	6,1	8,4	12,1	12,1	12,1	12,1	16,4
Max. current	A	8,0	8,0	11,2	11,2	11,2	15,2	19,4	19,4	19,4	19,4	26,3
LRA	A	98	98	131	131	131	169	136	136	136	136	184

High head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	6,1	8,4	8,4	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	11,2	15,2	15,2	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	131	169	169	169	136	136	184	184	184	221	221
Inverter pump model	-	NBE65-125/127	NBE65-125/137	NBE65-125/137	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	6,5	8,6	8,6	8,6	12,4	12,4	17,7	17,5	17,5	21,7	21,7
Max. current	A	10,5	13,4	13,4	13,4	19,3	19,3	26,6	28,0	28,0	34,0	34,0

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

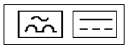


Table 32 – Electrical Data - CH4*HG0 Low Noise Models**

Models CH4***HG0L		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input	kW	150	176	194	226	237	257	297	345	392	464	506
OA (without PFC)	A	260	301	324	397	410	433	493	571	644	764	827
cosφ (without PFC)	-	0,83	0,84	0,86	0,82	0,84	0,86	0,87	0,87	0,88	0,88	0,88
cosφ (with PFC)	-	0,95	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94
Rated power												
FLI	A	484	544	582	682	753	813	923	983	994	1236	1124
Max. power input	kW	240	270	305	336	358	373	429	476	539	644	596
FLA	A	394	440	496	562	590	607	695	771	866	1038	962
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	366	412	468	535	542	568	663	771	820	990	915
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,89	0,95	0,94	0,94
LRA	A	835	911	1008	1069	1097	926	1039	1232	1285	1488	1450
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz										
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	139	165	181	213	222	242	279	327	372	442	484
Nominal current	A	243	284	304	377	386	409	466	544	612	728	791
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1

Nominal current	A	1,7	1,7	1,7	1,7	1,7	1,7	1,7	1,7	1,8	1,8	1,8
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps												
Std. head pump model	-	NB65-125/120-110	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147	NB80-160/147	NB80-160/151
Nominal power	kW	4,0	4,0	5,5	5,5	5,5	7,5	11,0	11,0	11,0	11,0	15,0
Motor power	kW	4,5	4,5	6,1	6,1	6,1	8,4	12,1	12,1	12,1	12,1	16,4
Max. current	A	8,0	8,0	11,2	11,2	11,2	15,2	19,4	19,4	19,4	19,4	26,3
LRA	A	98	98	131	131	131	169	136	136	136	136	184
High head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	6,1	8,4	8,4	8,4	12,1	12,1	16,4	16,4	16,4	20,1	20,1
Max. current	A	11,2	15,2	15,2	15,2	19,4	19,4	26,3	26,3	26,3	31,5	31,5
LRA	A	131	169	169	169	136	136	184	184	184	221	221
Inverter pump model	-	NBE65-125/127	NBE65-125/137	NBE65-125/137	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Motor power	kW	6,5	8,6	8,6	8,6	12,4	12,4	17,7	17,5	17,5	21,7	21,7
Max. current	A	10,5	13,4	13,4	13,4	19,3	19,3	26,6	28,0	28,0	34,0	34,0

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

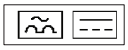


Table 33 – Electrical Data - FH4*HG0 Models**

Models FH4***HG0		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input (2)	kW	164	188	210	239	257	274	316	358	407	482	519
OA (without PFC) (2)	A	283	321	349	419	440	460	524	594	666	789	845
cosφ (without PFC) (2)	-	0,84	0,85	0,87	0,83	0,84	0,86	0,87	0,87	0,88	0,88	0,88
cosφ (with PFC) (2)	-	0,94	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94
Rated power												
FLI	A	481	541	579	679	749	809	918	978	988	1230	1118
Max. power input	kW	238	268	302	334	355	370	426	473	536	640	592
FLA	A	391	437	493	559	586	603	690	766	860	1032	956
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	363	409	464	531	538	563	658	734	815	984	908
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,93	0,95	0,94	0,94
LRA	A	832	908	1005	1066	1093	922	1034	1227	1279	1482	1444
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 5075Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz										
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	132	156	172	201	212	229	265	307	349	418	455
Nominal current	A	234	272	290	360	371	391	446	516	578	691	747

Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,9	4,9	4,9
Pumps												
Std. head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/144	NB65-160/157	NB65-160/157	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	5,5	7,5	7,5	11,0	11,0	11,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	6,1	8,4	8,4	12,1	12,1	12,1	16,4	16,4	20,1	20,1	23,4
Max. current	A	11,2	15,2	15,2	19,4	19,4	19,4	26,3	26,3	31,5	31,5	38,0
LRA	A	131	169	169	136	136	136	184	184	221	221	274
High head pump model	-	NB65-125/144	NB65-160/157	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/167	NB80-160/167	NB80-160/167	NB80-160/177	NB80-160/177
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0	30,0	30,0
Motor power	kW	12,1	12,1	12,1	16,4	16,4	20,0	23,4	23,4	23,4	32,1	32,1
Max. current	A	19,4	19,4	19,4	26,3	26,3	31,5	38,0	38,0	38,0	52,0	52,0
LRA	A	136	136	136	184	184	221	274	274	274	364	364
Inverter pump model	-	NBE65-125/144	NBE65-160/157	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/167	NBE80-160/167	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0	22,0	22,0
Motor power	kW	12,4	12,4	12,4	21,4	17,7	21,4	25,2	25,2	25,2	25,2	25,2
Max. current	A	19,3	19,3	19,3	26,6	26,6	32,3	39,9	39,9	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

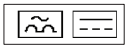


Table 34 – Electrical Data - FH4*HG0 Low Noise Models**

Models FH4***HG0L		065	075	080	090	100	110	125	140	165	180	195
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz										
Operating (1)												
Total power input	kW	153	180	198	231	244	264	304	354	404	476	520
OA (without PFC)	A	265	308	332	406	420	444	505	587	661	781	848
cosφ (without PFC)	-	0,83	0,84	0,86	0,82	0,84	0,86	0,87	0,87	0,88	0,88	0,88
cosφ (with PFC)	-	0,95	0,94	0,94	0,95	0,94	0,93	0,93	0,95	0,95	0,94	0,94
Rated power												
FLI	A	484	544	582	682	753	813	923	983	994	1236	1124
Max. power input	kW	240	270	305	336	358	373	429	476	539	644	596
FLA	A	394	440	496	562	590	607	695	771	866	1038	962
cosφ (without PFC)		0,88	0,88	0,89	0,86	0,88	0,89	0,89	0,89	0,90	0,90	0,89
FLA (with PFC)	A	366	412	468	535	542	568	663	771	820	990	915
cosφ (with PFC)		0,95	0,94	0,94	0,91	0,95	0,95	0,94	0,89	0,95	0,94	0,94
LRA	A	832	908	1008	1069	1097	926	1039	1232	1285	1488	1450
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x400 mm²	2x400 mm²	2x500 mm²	2x500 mm²
Control												
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz										

Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2	2	2
Compressors												
Power input	kW	141	168	184	217	227	247	285	335	382	452	496
Nominal current	A	246	289	309	383	393	417	475	557	627	743	810
Single compressor 1 - FLA	A	171	194	217	250	267	267	306	344	386	467	429
Single compressor 1 - FLI	A	216	246	260	310	370	370	420	450	450	566	510
Single compressor 1 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	586 - PW	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Single compressor 2 - FLA	A	171	194	217	250	250	267	306	344	386	467	429
Single compressor 2 - FLI	A	216	246	260	310	310	370	420	450	450	566	510
Single compressor 2 - LRA - Method starting	A	612 - PW	665 - PW	729 - PW	757 - PW	757 - YD	586 - YD	650 - YD	805 - YD	805 - YD	917 - YD	917 - YD
Fans												
Fans number	-	10	10	12	12	14	14	16	16	18	20	20
Power input	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps												
Std. head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/144	NB65-160/157	NB65-160/157	NB80-160/151	NB80-160/151	NB80-160/161	NB80-160/161	NB80-160/167
Nominal power	kW	5,5	7,5	7,5	11,0	11,0	11,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	6,1	8,4	8,4	12,1	12,1	12,1	16,4	16,4	20,1	20,1	23,4
Max. current	A	11,2	15,2	15,2	19,4	19,4	19,4	26,3	26,3	31,5	31,5	38,0
LRA	A	131	169	169	136	136	136	184	184	221	221	274
High head pump model	-	NB65-125/144	NB65-160/157	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/167	NB80-160/167	NB80-160/167	NB80-160/177	NB80-160/177
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0	30,0	30,0
Motor power	kW	12,1	12,1	12,1	16,4	16,4	20,0	23,4	23,4	23,4	32,1	32,1
Max. current	A	19,4	19,4	19,4	26,3	26,3	31,5	38,0	38,0	38,0	52,0	52,0
LRA	A	136	136	136	184	184	221	274	274	274	364	364
Inverter pump model	-	NBE65-125/144	NBE65-160/157	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/167	NBE80-160/167	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0	22,0	22,0
Motor power	kW	12,4	12,4	12,4	17,7	17,7	21,4	25,2	25,2	25,2	25,2	25,2
Max. current	A	19,3	19,3	19,3	26,6	26,6	32,3	39,9	39,9	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

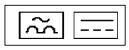


Table 35 – Electrical Data - NIZ*HG0 Models**

Models NIZ***HG0		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz				400V / 3Ph + PE / 50Hz					
Operating (1)										
Total power input (2)	kW	161	188	193	215	238	283	317	349	390
OA (without PFC) (2)	A	261	304	322	354	386	467	520	574	645
cosφ (without PFC) (2)	-	0,89	0,89	0,87	0,88	0,89	0,87	0,88	0,88	0,87
Rated power										
FLI	A	469	539	533	679	719	809	858	991	1035
Max. power input	kW	265	304	291	347	371	438	465	529	553
FLA	A	422	489	474	557	591	704	746	854	896
cosφ (without PFC)		0,91	0,90	0,88	0,90	0,91	0,90	0,90	0,89	0,89
LRA	A	88	88	956	795	834	1028	1101	1333	1455
Max. fuse (gG/aM)		800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM

Ring terminals with hole/Line screw fixing	A	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	A	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/ Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2
Compressors										
Power input	kW	129	156	155	177	193	238	266	291	326
Nominal current	A	212	255	263	295	317	398	442	486	547
Single compressor 1 - FLA	A	374	440	232	300	300	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358
Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4.8
Pumps										
Std. head pump model	-	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147
Nominal power	kW	4,0	5,5	5,5	5,5	5,5	7,5	11,0	11,0	11,0
Motor power	kW	4,5	6,1	6,1	6,1	6,1	8,4	12,1	12,1	12,1
Max. current	A	8,0	11,2	11,2	11,2	11,2	15,2	19,4	19,4	19,4
LRA	A	98	131	131	131	131	169	136	136	136
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	15,0	15,0
Motor power	kW	8,4	12,1	12,1	12,1	12,1	12,1	16,4	16,4	16,4
Max. current	A	15,2	19,4	19,4	19,4	19,4	19,4	26,3	26,3	26,3
LRA	A	169	136	136	136	136	136	184	184	184
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	15,0	15,0
Motor power	kW	8,6	12,4	12,4	21,4	12,4	12,4	17,7	17,5	17,5
Max. current	A	13,4	19,3	19,3	19,3	19,3	19,3	26,6	28,0	28,0
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161	NBE80-160/167
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,7	21,7	25,2
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0	39,9

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40 °C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

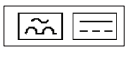


Table 36 – Electrical Data - NIZ***HG0 Low Noise Models

Models NIZ***HG0L		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz								
Operating (1)										
Total power input	kW	155	184	183	210	229	281	314	342	382
OA (without PFC)	A	252	299	307	345	372	464	515	563	632
cosφ (without PFC)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88	0,88	0,87
Rated power										
FLI	A	472	542	536	682	723	813	863	997	1041
Max. power input	kW	267	306	293	350	374	440	468	533	557
FLA	A	425	492	477	560	595	708	751	860	902
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,90	0,90	0,90	0,89	0,89
LRA	A	91	91	959	798	838	1032	1106	1339	1461
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2
Compressors										
Power input	kW	143	172	169	196	212	264	295	320	358
Nominal current	A	233	280	284	322	345	437	485	529	594
Single compressor 1 - FLA	A	374	440	232	300	300	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358
Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps										
Std. head pump model	-	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147
Nominal power	kW	4,0	5,5	5,5	5,5	5,5	7,5	11,0	11,0	11,0
Motor power	kW	4,5	6,1	6,1	6,1	6,1	8,4	12,1	12,1	12,1
Max. current	A	8,0	11,2	11,2	11,2	11,2	15,2	19,4	19,4	19,4
LRA	A	98	131	131	131	131	169	136	136	136
High head pump model	-	NB65-125/137	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	15,0	15,0
Motor power	kW	8,4	12,1	12,1	12,1	12,1	12,1	16,4	16,4	16,4
Max. current	A	15,2	19,4	19,4	19,4	19,4	19,4	26,3	26,3	26,3
LRA	A	169	136	136	136	136	136	184	184	184
Inverter pump model	-	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151
Nominal power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	15,0	15,0
Motor power	kW	8,6	12,4	12,4	21,4	12,4	12,4	17,7	17,5	17,5

Max. current	A	13,4	19,3	19,3	19,3	19,3	19,3	26,6	28,0	28,0
No-Glycol pump model	-	NBE65-160/157	NBE65-160/157	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/151	NBE80-160/161	NBE80-160/161	NBE80-160/167
Nominal power	kW	11,0	11,0	15,0	15,0	15,0	15,0	18,5	18,5	22,0
Motor power	kW	12,4	12,4	17,5	17,5	17,5	17,5	21,7	21,7	25,2
Max. current	A	19,3	19,3	28,0	28,0	28,0	28,0	34,0	34,0	39,9

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40 °C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

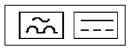


Table 37 – Electrical Data - CIZ*HG0 Models**

Models CIZ***HG0		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz								
Operating (1)										
Total power input (2)	kW	155	181	187	208	233	272	306	337	377
OA (without PFC) (2)	A	252	293	312	342	377	451	503	556	625
cosφ (without PFC) (2)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88	0,88	0,87
Rated power										
FLI	A	469	539	533	679	719	809	858	991	1035
Max. power input	kW	265	304	291	347	371	438	465	529	553
FLA	A	422	489	474	557	591	704	746	854	896
cosφ (without PFC)		0,91	0,90	0,88	0,90	0,91	0,90	0,90	0,89	0,89
LRA	A	69	69	956	795	834	1028	1101	1333	1455
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2
Compressors										
Power input	kW	125	151	151	172	191	230	258	283	317
Nominal current	A	206	247	257	287	313	387	429	473	533
Single compressor 1 - FLA	A	374	440	232	300	300	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358
Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input (2)	kW	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Nominal current (2)	A	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,9	4,9
Pumps										
Std. head pump model	-	NB65-125/120-110	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147
Nominal power	kW	4,0	4,0	5,5	5,5	5,5	7,5	11,0	11,0	11,0
Motor power	kW	4,5	4,5	6,1	6,1	6,1	8,4	12,1	12,1	12,1

Max. current	A	8,0	8,0	11,2	11,2	11,2	15,2	19,4	19,4	19,4
LRA	A	98	98	131	131	131	169	136	136	136
High head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0
Motor power	kW	6,1	8,4	8,4	8,4	12,1	12,1	16,4	16,4	16,4
Max. current	A	11,2	15,2	15,2	15,2	19,4	19,4	26,3	26,3	26,3
LRA	A	131	169	169	169	136	136	184	184	184
Inverter pump model	-	NBE65-125/127	NBE65-125/137	NBE65-125/137	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0
Motor power	kW	6,5	8,6	8,6	8,6	12,4	12,4	17,7	17,5	17,5
Max. current	A	10,5	13,4	13,4	13,4	19,3	19,3	26,6	28,0	28,0

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

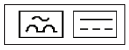


Table 38 – Electrical Data - CIZ*HG0 Low Noise Models**

Models CIZ***HG0L		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz								
Operating (1)										
Total power input	kW	148	176	176	201	220	268	301	328	367
OA (without PFC)	A	242	288	298	333	359	446	496	543	610
cosφ (without PFC)	-	0,88	0,88	0,85	0,87	0,89	0,87	0,88	0,87	0,87
Rated power										
FLI	A	472	542	536	682	723	813	863	997	1041
Max. power input	kW	267	306	293	350	374	440	468	533	557
FLA	A	425	492	477	560	595	708	751	860	902
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,91	0,90	0,90	0,89	0,89
LRA	A	72	72	959	798	838	1032	1106	1339	1461
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2
Compressors										
Power input	kW	137	165	163	188	205	253	283	308	345
Nominal current	A	224	270	276	311	334	421	467	511	574
Single compressor 1 - FLA	A	374	440	232	300	300	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358
Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1

Nominal current	A	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps										
Std. head pump model	-	NB65-125/120-110	NB65-125/120-110	NB65-125/127	NB65-125/127	NB65-125/127	NB65-125/137	NB65-125/144	NB80-160/147	NB80-160/147
Nominal power	kW	4,0	4,0	5,5	5,5	5,5	7,5	11,0	11,0	11,0
Motor power	kW	4,5	4,5	6,1	6,1	6,1	8,4	12,1	12,1	12,1
Max. current	A	8,0	8,0	11,2	11,2	11,2	15,2	19,4	19,4	19,4
LRA	A	98	98	131	131	131	169	136	136	136
High head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/137	NB65-125/144	NB65-125/144	NB65-160/173	NB80-160/151	NB80-160/151
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0
Motor power	kW	6,1	8,4	8,4	8,4	12,1	12,1	16,4	16,4	16,4
Max. current	A	11,2	15,2	15,2	15,2	19,4	19,4	26,3	26,3	26,3
LRA	A	131	169	169	169	136	136	184	184	184
Inverter pump model	-	NBE65-125/127	NBE65-125/137	NBE65-125/137	NBE65-125/137	NBE65-125/144	NBE65-125/144	NBE65-160/173	NBE80-160/151	NBE80-160/151
Nominal power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0
Motor power	kW	6,5	8,6	8,6	8,6	12,4	12,4	17,7	17,5	17,5
Max. current	A	10,5	13,4	13,4	13,4	19,3	19,3	26,6	28,0	28,0

(1) Nominal conditions: water inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

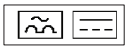


Table 39 – Electrical Data - FIZ*HG0 Models**

Models FIZ***HG0		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz								
Operating (1)										
Total power input (2)	kW	160	186	192	214	238	281	316	348	388
OA (without PFC) (2)	A	260	302	321	352	386	465	517	571	642
cosφ (without PFC) (2)	-	0,89	0,89	0,87	0,88	0,89	0,87	0,88	0,88	0,87
Rated power										
FLI	A	469	539	533	679	719	809	858	991	1035
Max. power input	kW	265	304	291	347	371	438	465	529	553
FLA	A	422	489	474	557	591	704	746	854	896
cosφ (without PFC)		0,91	0,90	0,88	0,90	0,91	0,90	0,90	0,89	0,89
LRA	A	69	69	956	795	834	1028	1101	1333	1455
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM	1250gG/1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2
Compressors										
Power input	kW	128	154	154	176	193	236	265	290	324
Nominal current	A	211	253	262	293	317	396	439	483	544
Single compressor 1 - FLA	A	374	440	232	300	300	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358

Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input (2)	kW	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2	3,2
Nominal current (2)	A	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9	4,9
Max. Current (2)	A	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8	4,8
Pumps										
Std. head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/144	NB65-160/157	NB65-160/157	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	5,5	7,5	7,5	11,0	11,0	11,0	15,0	18,5	18,5
Motor power	kW	6,1	8,4	8,4	12,1	12,1	12,1	16,4	20,1	20,1
Max. current	A	11,2	15,2	15,2	19,4	19,4	19,4	26,3	31,5	31,5
LRA	A	131	169	169	136	136	136	184	221	221
High head pump model	-	NB65-125/144	NB65-160/157	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/167	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0
Motor power	kW	12,1	12,1	12,1	16,4	16,4	20,0	23,4	23,4	23,4
Max. current	A	19,4	19,4	19,4	26,3	26,3	31,5	38,0	38,0	38,0
LRA	A	136	136	136	184	184	221	274	274	274
Inverter pump model	-	NBE65-125/144	NBE65-160/157	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0
Motor power	kW	12,4	12,4	12,4	21,4	17,7	21,4	25,2	25,2	25,2
Max. current	A	19,3	19,3	19,3	26,6	26,6	32,3	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(2) Base EC fans versions.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):

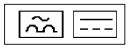
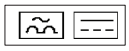


Table 40 – Electrical Data - FIZ*HG0 Low Noise Models**

Models FIZ***HG0L		065	075	080	085	095	110	125	140	150
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz								
Operating (1)										
Total power input	kW	154	182	182	208	227	279	312	339	379
OA (without PFC)	A	250	296	305	343	369	461	511	559	628
cosφ (without PFC)	-	0,89	0,89	0,86	0,88	0,89	0,87	0,88	0,87	0,87
Rated power										
FLI	A	472	542	536	682	723	813	863	997	1041
Max. power input	kW	267	306	293	350	374	440	468	533	557
FLA	A	425	492	477	560	595	708	751	860	902
cosφ (without PFC)		0,91	0,90	0,89	0,90	0,91	0,90	0,90	0,89	0,89
LRA	A	72	72	959	798	838	1032	1106	1339	1461
Max. fuse (gG/aM)	A	800gG/	800gG/	800gG/	800gG/	800gG/	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM	1250gG/ 1250aM
Ring terminals with hole/Line screw fixing	mm/Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm	M12 / 50-75Nm
QSA Minimun Cable section recommended (3)	mm²	2x185 mm²	2x185 mm²	2x185 mm²	2x240 mm²	2x240 mm²	2x300 mm²	2x300 mm²	2x500 mm²	2x500 mm²
Control										
Control power supply (only for option Fast-Start)	V/Ph/Hz	230V / 1Ph + N + PE / 50Hz								
Pmax	kW	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59	0,59
Imax	A	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30	2,30
LRA	A	7	7	7	7	7	7	7	7	7
Cable section min./max.	mm²	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35	1,5/35
Max. fuse (gG/aM)	A	40	40	40	40	40	40	40	40	40
Line screw fixing	Nm	2	2	2	2	2	2	2	2	2

Compressors										
Power input	kW	142	170	167	194	210	262	293	317	355
Nominal current	A	231	277	282	320	342	434	481	525	590
Single compressor 1 - FLA	A	374	440	232	304	304	374	374	440	440
Single compressor 1 - FLI	A	420	490	260	340	340	420	420	490	490
Single compressor 1 - LRA - Method starting	A	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.	20 - Inv.
Single compressor 2 - FLA	A			183	198	222	262	295	326	358
Single compressor 2 - FLI	A			214	280	310	320	360	413	447
Single compressor 2 - LRA - Method starting	A			665 - PW	436 - YD	465 - YD	586 - YD	650 - YD	805 - YD	917 - YD
Fans										
Fans number	-	10	10	12	12	14	14	16	18	20
Power input	kW	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Nominal current	A	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
Max. Current	A	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Pumps										
Std. head pump model	-	NB65-125/127	NB65-125/137	NB65-125/137	NB65-125/144	NB65-160/157	NB65-160/157	NB80-160/151	NB80-160/161	NB80-160/161
Nominal power	kW	5,5	7,5	7,5	11,0	11,0	11,0	15,0	18,5	18,5
Motor power	kW	6,1	8,4	8,4	12,1	12,1	12,1	16,4	20,1	20,1
Max. current	A	11,2	15,2	15,2	19,4	19,4	19,4	26,3	31,5	31,5
LRA	A	131	169	169	136	136	136	184	221	221
High head pump model	-	NB65-125/144	NB65-160/157	NB65-160/157	NB65-160/173	NB65-160/173	NB65-160/177	NB80-160/167	NB80-160/167	NB80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0
Motor power	kW	12,1	12,1	12,1	16,4	16,4	20,0	23,4	23,4	23,4
Max. current	A	19,4	19,4	19,4	26,3	26,3	31,5	38,0	38,0	38,0
LRA	A	136	136	136	184	184	221	274	274	274
Inverter pump model	-	NBE65-125/144	NBE65-160/157	NBE65-160/157	NBE65-160/173	NBE65-160/173	NBE65-160/177	NBE80-160/167	NBE80-160/167	NBE80-160/167
Nominal power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0	22,0
Motor power	kW	12,4	12,4	12,4	21,4	17,7	21,4	25,2	25,2	25,2
Max. current	A	19,3	19,3	19,3	26,6	26,6	32,3	39,9	39,9	39,9

(1) Nominal conditions: 30% eth.glycol inlet/outet temperatures 29/20°C, outdoor air temperature 35°C.
(3) PVC cable 40°C see tab.6 EN60204-1 B1 - line SCPD must be coordinated with the line section OA, FLA, LRA are calculated for unit without pumps.
For R513A consider an approximate increase of 3-6% on operating current and power input. For detailed data please refer to Vertiv™ CRS selection software.
If the unit with EC-FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols (This circuit breaker is type B.):



6.5 Noise Levels

The tables show the noise data for different fans configurations, with the unit operating continuously at full load at the following conditions:

Evaporator Fluid temperatures		Air temperature
Inlet	Outlet	
26°C or 29°C	20°C	35°C

Note 1 *The value of **PWL** (Sound Power Level) is calculated according to the ISO 3744 method.*
Sound Power Level tolerance for each octave band: -0 / +2 dB.

Note 2 *The value of **SPL** (Sound Pressure Level) for every octave band frequency is measured in free field conditions and 1 meter from the unit according to the ISO 3744 average method.*
Sound Pressure Level tolerance for each octave band: -0 / +2 dB.

Note 3 *The installation of the unit in a high-reverberating environment will adversely affect the declared SPL values.*

Note 4 *Avoid positioning in areas with possible reverberation of the sound waves that can adversely effect the noise levels.*

Note 5 *Values valid for Freecooling and No-glycol units, Sound levels of the chillers must be obtained from Vertiv™ CRS selection software.*

- SPL Measured according ISO 3744 methods: PWL calculated according ISO 3744

Table 41 – Sound Pressure Levels (SPL) - *H4/*H3 with Base EC Fans φ910 @1100rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"SPL" Sound pressure level @1m [dB]								
065	82	85	82	84	78	75	67	60	84,3
075	82	85	82	84	78	75	67	60	84,4
080	83	86	83	85	79	76	68	61	84,7
090	83	86	83	85	79	76	68	61	84,8
100	83	86	83	85	79	76	68	61	85,0
110	83	86	83	85	79	76	68	61	85,1
125	83	86	83	85	79	76	68	61	85,3
140	83	86	83	85	79	76	68	61	85,4
165	84	87	84	86	80	77	69	62	85,7
180	84	87	84	86	80	77	69	62	85,9
195	84	87	84	86	80	77	69	62	86,0

Table 42 – Sound Power Levels (PWL) - *H4/H3 with Base EC Fans φ910 @1100rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"PWL" Sound power level [dB]								
065	104	107	104	106	100	97	89	82	105,8
075	104	107	104	106	100	97	89	82	105,9
080	104	107	104	106	100	97	89	82	106,6
090	105	108	105	107	101	98	90	83	106,7
100	105	108	105	107	101	98	90	83	107,4
110	105	108	105	107	101	98	90	83	107,4
125	106	109	106	108	102	99	91	84	108,0
140	106	109	106	108	102	99	91	84	108,1
165	107	110	107	109	103	100	92	85	108,7
180	107	110	107	109	103	100	92	85	109,2
195	107	110	107	109	103	100	92	85	109,3

Table 43 – Sound Pressure Levels (SPL) - *H4/*H3 with Premium EC Fans φ910 @980rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"SPL" Sound pressure level @1m [dB]								
065	77	80	77	79	73	70	62	55	78,7
075	77	80	77	79	73	70	62	55	78,8
080	77	80	77	79	73	70	62	55	79,1
090	77	80	77	79	73	70	62	55	79,3
100	77	80	77	79	73	70	62	55	79,5

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
110	77	80	77	79	73	70	62	55	**79,6**
125	78	81	78	80	74	71	63	56	**79,9**
140	78	81	78	80	74	71	63	56	**80,1**
165	78	81	78	80	74	71	63	56	**80,2**
180	78	81	78	80	74	71	63	56	**80,6**
195	79	82	79	81	75	72	64	57	**80,8**

Table 44 – Sound Power Levels (PWL) - *H4/H3 with Premium EC Fans φ910 @980rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***H4/ *H3**	"PWL" Sound power level [dB]								
065	98	101	98	100	94	91	83	76	**100,2**
075	98	101	98	100	94	91	83	76	**100,3**
080	99	102	99	101	95	92	84	77	**101,1**
090	99	102	99	101	95	92	84	77	**101,3**
100	100	103	100	102	96	93	85	78	**101,9**
110	100	103	100	102	96	93	85	78	**102,0**
125	101	104	101	103	97	94	86	79	**102,7**
140	101	104	101	103	97	94	86	79	**102,9**
165	101	104	101	103	97	94	86	79	**103,3**
180	102	105	102	104	98	95	87	80	**104,0**
195	102	105	102	104	98	95	87	80	**104,2**

Table 45 – Sound Pressure Levels (SPL) - *H4/*H3 Low noise version φ800 fans @850rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***H4/ *H3**	"SPL" Sound pressure level @1m [dB]								
065	72	73	72	73	66	60	53	48	**72,3**
075	72	73	73	73	66	60	53	48	**73,0**
080	73	74	73	74	67	61	54	49	**73,2**
090	73	74	74	74	67	61	54	49	**74,0**
100	74	75	74	75	68	62	55	50	**74,1**
110	74	75	74	75	68	62	55	50	**74,4**
125	74	75	75	75	68	62	55	50	**75,0**
140	75	76	76	76	69	63	56	51	**75,9**
165	76	77	76	77	70	64	57	52	**76,4**
180	77	78	77	78	71	65	58	53	**77,1**
195	77	78	78	78	71	65	58	53	**77,7**

Table 46 – Sound Power Levels (PWL) - *H4/H3 Low noise version φ800 fans @850rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"PWL" Sound power level [dB]								
065	93	94	94	94	87	81	74	69	93,8
075	94	95	94	95	88	82	75	70	94,5
080	95	96	95	96	89	83	76	71	95,2
090	95	96	96	96	89	83	76	71	96,0
100	96	97	96	97	90	84	77	72	96,4
110	96	97	97	97	90	84	77	72	96,8
125	97	98	98	98	91	85	78	73	97,7
140	98	99	99	99	92	86	79	74	98,6
165	99	100	99	100	93	87	80	75	99,5
180	100	101	100	101	94	88	81	76	100,5
195	101	102	101	102	95	89	82	77	101,1

Table 47 – Sound Pressure Levels (SPL) - *H4/*H3 Quiet version φ800 fans @700rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"SPL" Sound pressure level @1m [dB]								
065	67	68	68	68	61	55	48	43	68,0
075	68	69	69	69	62	56	49	44	68,9
080	69	70	69	70	63	57	50	45	69,1
090	69	70	70	70	63	57	50	45	70,0
100	69	70	70	70	63	57	50	45	70,0
110	70	71	70	71	64	58	51	46	70,4
125	70	71	71	71	64	58	51	46	71,0
140	71	72	72	72	65	59	52	47	72,0
165	72	73	73	73	66	60	53	48	72,6
180	73	74	73	74	67	61	54	49	73,4
195	74	75	74	75	68	62	55	50	74,3

Table 48 – Sound Power Levels (PWL) - *H4/H3 Quiet version φ800 fans @700rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*H4/ *H3	"PWL" Sound power level [dB]								
065	89	90	89	90	83	77	70	65	89,5
075	90	91	90	91	84	78	71	66	90,4
080	91	92	91	92	85	79	72	67	91,1

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
090	91	92	92	92	85	79	72	67	**92,0**
100	92	93	92	93	86	80	73	68	**92,4**
110	92	93	93	93	86	80	73	68	**92,8**
125	93	94	94	94	87	81	74	69	**93,7**
140	94	95	95	95	88	82	75	70	**94,7**
165	95	96	96	96	89	83	76	71	**95,7**
180	96	97	97	97	90	84	77	72	**96,8**
195	97	98	98	98	91	85	78	73	**97,7**

Table 49 – Sound Pressure Levels (SPL) - *IZ with Base EC Fans φ910 @1100rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***IZ**	"SPL" Sound pressure level @1m [dB]								
065	84	80	83	83	80	74	69	64	**84,4**
075	84	80	83	83	81	74	69	64	**84,5**
080	84	83	83	84	80	75	68	63	**84,8**
085	84	83	83	84	80	75	68	63	**84,8**
095	84	83	83	84	80	75	69	63	**85,1**
110	84	83	83	84	80	75	69	63	**85,1**
125	84	84	84	84	80	76	69	63	**85,3**
140	84	84	84	85	81	76	69	63	**85,6**
150	85	84	84	85	81	76	69	64	**85,8**

Table 50 – Sound Power Levels (PWL) - *IZ with Base EC Fans φ910 @1100rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***IZ**	"PWL" Sound power level [dB]								
065	106	102	105	104	102	96	90	86	**105,9**
075	106	102	105	104	102	96	90	86	**106,0**
080	104	104	105	106	102	94	89	83	**106,7**
085	104	105	105	106	102	94	89	83	**106,8**
095	105	105	105	106	103	95	89	84	**107,4**
110	105	105	105	106	103	95	89	84	**107,4**
125	106	106	106	107	103	96	90	85	**108,0**
140	106	106	107	108	104	96	91	85	**108,6**
150	107	107	107	108	104	97	91	86	**109,1**

Table 51 – Sound Pressure Levels (SPL) - *IZ with Premium EC Fans φ910 @980rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*IZ	"PWL" Sound power level [dB]								
065	79	75	78	77	75	68	63	59	78,8
075	79	75	78	77	75	69	63	59	79,1
080	78	78	78	78	74	69	63	57	79,2
085	78	78	78	79	74	70	63	57	79,5
095	79	78	78	79	75	70	63	58	79,8
110	78	78	78	79	75	70	63	57	79,6
125	79	78	78	79	75	70	63	58	79,8
140	79	78	78	79	75	70	63	58	79,8
150	79	78	78	79	75	70	64	58	80,1

Table 52 – Sound Power Levels (PWL) - *IZ with Premium EC Fans φ910 @980rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*IZ	"PWL" Sound power level [dB]								
065	96	95	97	98	98	88	84	78	100,3
075	97	96	97	98	98	88	84	78	100,6
080	100	100	100	100	96	91	85	79	101,2
085	100	100	100	101	96	92	85	79	101,5
095	101	101	101	101	97	92	86	80	102,2
110	101	100	100	101	97	92	86	80	102,0
125	101	101	101	102	98	93	86	80	102,6
140	102	101	101	102	98	93	86	81	102,9
150	102	102	102	103	98	94	87	81	103,5

Table 53 – Sound Pressure Levels (SPL) - *IZ Low noise version φ800 fans @850rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*IZ	"PWL" Sound power level [dB]								
065	69	68	70	71	71	61	57	51	73,3
075	70	70	71	72	72	62	58	52	74,5
080	72	72	72	73	69	62	56	51	74,0
085	73	73	73	74	70	63	57	52	75,1
095	73	73	73	74	71	63	57	52	75,3
110	72	72	73	73	70	62	56	51	74,5

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
125	75	75	75	76	73	65	59	54	**77,3**
140	74	74	74	74	70	66	59	53	**75,4**
150	75	74	74	75	71	66	60	54	**76,0**

Table 54 – Sound Power Levels (PWL) - *IZ Low noise version φ800 fans @850rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***IZ**	"PWL" Sound power level [dB]								
065	92	93	93	94	90	82	77	71	**94,8**
075	94	94	94	95	91	84	78	73	**96,0**
080	94	94	94	95	91	84	78	73	**96,0**
085	95	95	95	96	92	85	79	74	**97,1**
095	95	95	96	97	93	85	80	74	**97,6**
110	95	95	95	96	92	85	79	73	**96,9**
125	98	98	98	99	95	88	82	77	**100,1**
140	96	96	97	97	94	86	80	75	**98,5**
150	97	97	97	98	95	87	81	76	**99,4**

Table 55 – Sound Pressure Levels (SPL) - *IZ Quiet version φ800 fans @700rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
***IZ**	"PWL" Sound power level [dB]								
065	65	64	66	67	67	57	53	47	**69,4**
075	67	66	67	68	68	59	54	49	**70,8**
080	68	68	68	69	66	58	52	47	**70,3**
085	69	69	70	70	67	59	53	48	**71,5**
095	69	69	70	70	67	59	53	48	**71,5**
110	68	68	69	70	66	58	53	47	**70,7**
125	69	69	69	70	67	59	53	48	**71,3**
140	70	70	70	71	67	62	55	49	**71,6**
150	71	71	71	71	67	63	56	50	**72,3**

Table 56 – Sound Power Levels (PWL) - *IZ Quiet version φ800 fans @700rpm

Model	Octave Band Frequency [Hz]								Total [dBA]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
*IZ	"PWL" Sound power level [dB]								
065	89	89	89	90	86	79	73	67	90,9
075	90	90	90	91	88	80	74	69	92,3
080	90	90	90	91	88	80	74	69	92,3
085	91	91	91	92	89	81	75	70	93,4
095	92	92	92	93	89	82	76	70	93,9
110	91	91	91	92	88	81	75	70	93,1
125	92	92	92	93	89	82	76	71	94,0
140	92	92	93	94	90	82	77	71	94,7
150	93	93	94	95	91	83	78	72	95,7

6.6 User pump/s options

Table 57 – (2 Poles) Standard head pressure Pump Option Standard ΔT *

Freecooling Models	FH4/FH3	065 SG0	075 SG0	080 SG0	090 SG0	100 SG0	110 SG0	125 SG0	140 SG0
	FIZ	065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0	-
Pump model	-	65-125/137	65-125/144	65-125/144	65-160/173	80-160/151	80-160/161	80-160/161	80-160/167
Nominal motor power	kW	7.5	11.0	11.0	15.0	15.0	18.5	18.5	22.0
Sound power level	dB(A)	73.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Additional unit weight (single pump option)	kg	179	224	224	234	294	309	309	325
Freecooling Glycol-Free Models	**NH4/NH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	NIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-125/137	65-125/144	65-125/144	65-160/173	80-160/151	80-160/151	80-160/161	80-160/161
Nominal motor power	kW	7.5	11.0	11.0	15.0	15.0	15.0	18.5	18.5
Sound power level	dB(A)	73.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Additional unit weight (single pump option)	kg	179	224	224	234	294	294	309	309
Chiller Models	**CH4/CH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	CIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-125/127	65-125/127	65-125/137	65-125/144	80-160 /147-127	80-160 /147-127	80-160/151	80-160/151
Nominal motor power	kW	5.5	5.5	7.5	11.0	11.0	11.0	15.0	15.0
Sound power level	dB(A)	73.0	73.0	73.0	75.0	75.0	75.0	75.0	75.0
Additional unit weight (single pump option)	kg	169	169	179	224	284	284	294	294

* data referred to each pump under nominal design conditions

Table 58 – (2 Poles) Standard head pressure Pump Option High ΔT *

Freecooling Models	FH4/FH3	065 HG0	075 HG0	080 HG0	090 HG0	100 HG0	110 HG0	125 HG0	140 HG0
	FIZ	065 HG0	075 HG0	080 HG0	085 HG0	095 HG0	110 HG0	125 HG0	-
Pump model	-	65-125/ 127	65-125/ 137	65-125/ 137	65-125/ 144	65-160/ 157	65-160/ 157	80-160/ 151	80-160/ 151
Nominal motor power	kW	5,5	7,5	7,5	11,0	11,0	11,0	15,0	15,0
Sound power level	dB(A)	73,0	73,0	73,0	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	169	179	179	224	275	275	294	294
Freecooling Glycol-Free Models	**NH4/NH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	NIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-125/ 120-110	65-125/ 127	65-125/ 127	65-125/ 127	65-125/ 127	65-125/ 137	65-125/ 144	80-160/ 151
Nominal motor power	kW	4,0	5,5	5,5	5,5	5,5	7,5	11,0	15,0
Sound power level	dB(A)	73,0	73,0	73,0	73,0	73,0	73,0	75,0	75,0
Additional unit weight (single pump option)	kg	158	169	169	169	223	233	278	294
Chiller Models	**CH4/CH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	CIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-125/ 120-110	65-125/ 120-110	65-125/ 127	65-125/ 127	65-125/ 127	65-125/ 137	65-125/ 144	80-160/ 147-127
Nominal motor power	kW	4,0	4,0	5,5	5,5	5,5	7,5	11,0	11,0
Sound power level	dB(A)	73,0	73,0	73,0	73,0	73,0	73,0	75,0	75,0
Additional unit weight (single pump option)	kg	158	158	169	169	223	233	278	284

Freecooling Models	FH4/FH3			165 HG0	180 HG0	195 HG0
	FIZ	140 HG0	150 HG0			
Pump model	-	80-160/ 151	80-160/ 161	80-160/ 161	80-160/ 161	80-160/ 167
Nominal motor power	kW	15,0	18,5	18,5	18,5	22,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	294	309	309	309	325
Freecooling Glycol-Free Models	**NH4/NH3**			**165 HG0**	**180 HG0**	**195 HG0**
	NIZ	**140 HG0**	**150 HG0**			
Pump model	-	80-160/ 147-127	80-160/ 147-127	80-160/ 147-127	80-160/ 151	80-160/ 151
Nominal motor power	kW	11,0	11,0	11,0	15,0	15,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	284	284	284	294	294
Chiller Models	**CH4/CH3**			**165 HG0**	**180 HG0**	**195 HG0**
	CIZ	**140 HG0**	**150 HG0**			
Pump model	-	80-160/ 147-127	80-160/ 147-127	80-160/ 147-127	80-160/ 147-127	80-160/151
Nominal motor power	kW	11,0	11,0	11,0	11,0	15
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	284	284	284	284	294

* data referred to each pump under nominal design conditions

Table 59 – (2 Poles) High head pressure Pump Option Standard ΔT *

Freecooling Models	FH4/FH3	065 SG0	075 SG0	080 SG0	090 SG0	100 SG0	110 SG0	125 SG0	140 SG0
	FIZ	065 SG0	075 SG0	080 SG0	085 SG0	095 SG0	110 SG0	125 SG0	-
Pump model	-	65-160/157	65-160/173	65-160/173	65-160/177	80-160/161	80-160/167	80-160/167	80-160/177
Nominal motor power	kW	11,0	15,0	15,0	18,5	18,5	22,0	22,0	30,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	221	234	234	247	309	325	325	440
Freecooling Glycol-Free Models	**NH4/NH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	NIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-160/157	65-160/173	65-160/173	65-160/177	80-160/161	80-160/161	80-160/167	80-160/167
Nominal motor power	kW	11,0	15,0	15,0	18,5	18,5	18,5	22,0	22,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	221	234	234	247	309	309	325	325
Chiller Models	**CH4/CH3**	**065 SG0**	**075 SG0**	**080 SG0**	**090 SG0**	**100 SG0**	**110 SG0**	**125 SG0**	**140 SG0**
	CIZ	**065 SG0**	**075 SG0**	**080 SG0**	**085 SG0**	**095 SG0**	**110 SG0**	**125 SG0**	**-**
Pump model	-	65-125/137	65-125/144	65-125/144	65-160/173	80-160/151	80-160/151	80-160/161	80-160/161
Nominal motor power	kW	7,5	11,0	11,0	15,0	15,0	15,0	18,5	18,5
Sound power level	dB(A)	73,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	179	224	224	234	294	294	309	309

* data referred to each pump under nominal design conditions

Table 60 – (2 Poles) High head pressure Pump Option High ΔT *

Freecooling Models	FH4/FH3	065 HG0	075 HG0	080 HG0	090 HG0	100 HG0	110 HG0	125 HG0	140 HG0
	FIZ	065 HG0	075 HG0	080 HG0	085 HG0	095 HG0	110 HG0	125 HG0	-
Pump model	-	65-125/144	65-160/157	65-160/157	65-160/173	65-160/173	65-160/177	80-160/167	80-160/167
Nominal motor power	kW	11,0	11,0	11,0	15,0	15,0	18,5	22,0	22,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	224	221	221	234	288	301	325	325
Freecooling Glycol-Free Models	**NH4/NH3**	**065 HG0**	**075 HG0**	**080 HG0**	**090 HG0**	**100 HG0**	**110 HG0**	**125 HG0**	**140 HG0**
	NIZ	**065 HG0**	**075 HG0**	**080 HG0**	**085 HG0**	**095 HG0**	**110 HG0**	**125 HG0**	
Pump model	-	65-125/137	65-125/144	65-125/144	65-125/144	65-125/144	65-125/144	65-160/173	80-160/161
Nominal motor power	kW	7,5	11,0	11,0	11,0	11,0	11,0	15,0	18,5
Sound power level	dB(A)	73,0	75,0	75,0	75,0	75,0	75,0	75,0	75.0
Additional unit weight (single pump option)	kg	179	224	224	224	278	278	288	309
Chiller Models	**CH4/CH3**	**065 HG0**	**075 HG0**	**080 HG0**	**090 HG0**	**100 HG0**	**110 HG0**	**125 HG0**	**140 HG0**
	CIZ	**065 HG0**	**075 HG0**	**080 HG0**	**085 HG0**	**095 HG0**	**110 HG0**	**125 HG0**	**-**
Pump model	-	65-125/127	65-125/137	65-125/137	65-125/137	65-125/144	65-125/144	65-160/173	80-160/151
Nominal motor power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0
Sound power level	dB(A)	73,0	73,0	73,0	73,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	169	179	179	179	278	278	288	294

Freecooling Models	FH4/FH3			165 HG0	180 HG0	195 HG0
	FIZ	140 HG0	150 HG0			
Pump model	-	80-160/ 161	80-160/ 167	80-160/ 167	80-160/ 177	80-160/ 177
Nominal motor power	kW	18,5	22,0	22,0	30,0	30,0
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	309	325	325	440	440
Freecooling Glycol-Free Models	**NH4/NH3**			**165 HG0**	**180 HG0**	**195 HG0**
	NIZ	**140 HG0**	**150 HG0**			
Pump model	-	80-160/ 151	80-160/ 151	80-160/ 161	80-160/ 161	80-160/ 161
Nominal motor power	kW	15,0	15,0	18,5	18,5	18,5
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	294	294	309	309	309
Chiller Models	**CH4/CH3**			**165 HG0**	**180 HG0**	**195 HG0**
	CIZ	**140 HG0**	**150 HG0**			
Pump model	-	80-160/ 151	80-160/ 151	80-160/ 151	80-160/ 161	80-160/ 161
Nominal motor power	kW	15,0	15,0	15,0	18,5	18,5
Sound power level	dB(A)	75,0	75,0	75,0	75,0	75,0
Additional unit weight (single pump option)	kg	294	294	294	309	309

* data referred to each pump under nominal design conditions

6.7 Adiabatic predisposition option

Liebert® AFC units configured for installing the adiabatic system include:

- An expansion module of the **Vertiv™ iCOM3™** controller and a pre-cabled interface to the adiabatic system.
- Modified hydraulic piping to allow the installation of adiabatic PADs on the lateral side of the unit.
- Closing panels for avoiding air bypasses once the adiabatic system will be installed.

The adiabatic predisposition leads to a weight increase of the overall unit, summarized in the following table:

Additional unit weight with adiabatic predisposition [kg]					
10 FANS	12 FANS	14 FANS	16 FANS	18 FANS	20 FANS
302	329	366	418	482	553

7. Handling

7.1 Safety Instructions

WARNING

Improper handling can cause injury or death.
Only authorized personnel is allowed to move, lift, remove packaging from or prepare the unit for installation.
The authorized personnel must be properly trained and qualified, wear appropriate personal protective equipment and use adequate moving equipment (cranes, forklift, etc.).

WARNING

Make sure to use transport and lifting equipment rated for the unit dimensions and weight.
See *Annex I - Dimensions and Weights*

WARNING

Never walk or stay below a suspended load.

CAUTION

Sharp edges, splinters and exposed fasteners.
Wear protective gloves before operating on the unit.

NOTICE

Improper handling can cause product damage.

WARNING

The free-cooling batteries are supplied dry or charged with the right % of glycol to avoid possible problems due to frost during the storage period

7.2 Inspection

- After receiving the product, check the accessories against the packing list.
- If any parts are found missing or damaged, please report to the carrier immediately.
- If you find any damage, please report to the carrier and to the local distributor too.

- **Unpacking:** dispose of the packaging products by transferring them to specialized collection or recycling centers (follow the local regulations in force).

Warnings for A2L Gas Supplied Units

In the case of closed trucks, the compartment containing the unit must be opened without possible ignition sources nearby and ensuring adequate subsequent ventilation before any further operation.

Upon receipt of the unit, a leak detector with a sensitivity of not less than **3** g/year must be used to check the most critical areas of the refrigeration circuit that may have suffered damage during transport or handling (in particular the area inside the compressor box): this operation must be done in a well-ventilated environment and free from potential sources of ignition.

Special boxes for marine transport have dedicated indications for unpacking and disposal; when unpacking there is a residual risk of releasing a flammable air mixture: this operation must be done in a well-ventilated environment and free from potential sources of ignition.

7.3 Storage

You may keep the unit with the following ambient conditions:

Item	Requirement
Storage environment	Outdoor environment.
Ambient temperature	0°C ÷ +45°C **NOTE:** *The ambient temperature must not reach the 54°C, because in this condition the safety valve on the low pressure side will open with R134a and R513A.* **NOTE:** *The ambient temperature must not go below -20°C, because in this condition R1234ze pressure is below the ambient ones.*
Ambient humidity	< 80% not condensing; all electronic devices inside EP are protected with desiccant bags.
Storage time	The total storage time should not exceed one month; for storage with high R.H ambient or near sea storage time should not exceed **2** weeks. If the storage time is longer than **six** months, then you replace desiccant bags, must check the functionality of sensors and other electronic devices before putting in operation the unit.

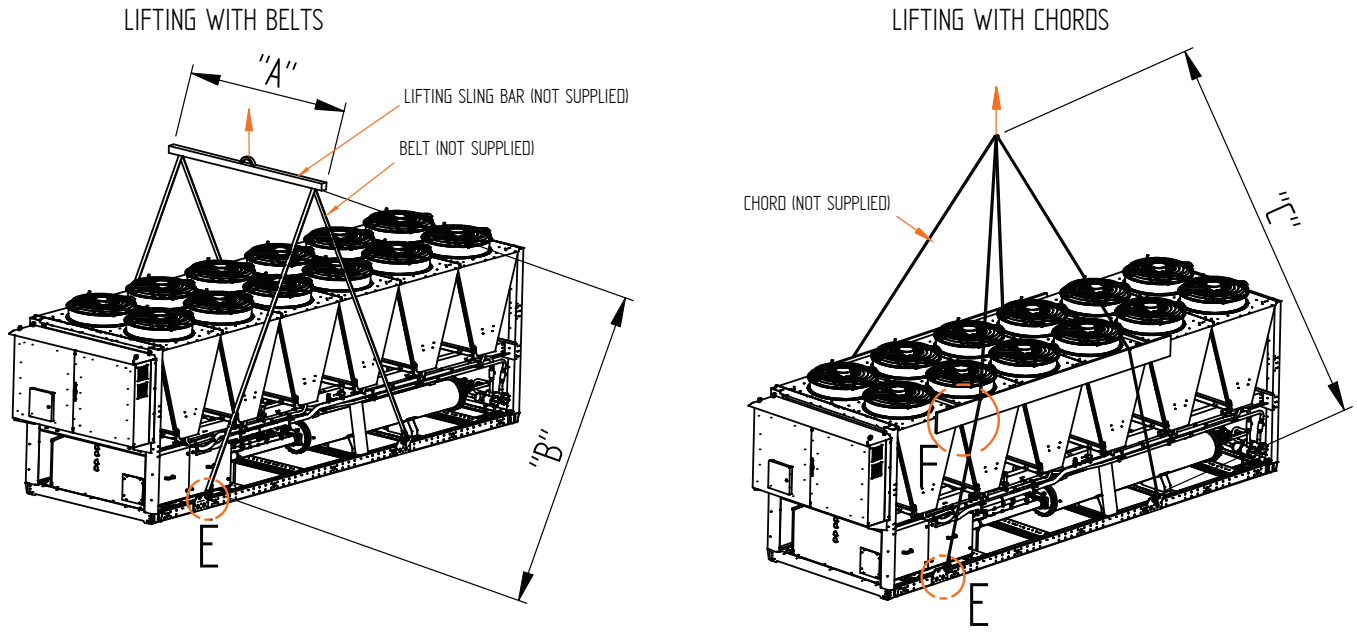
Warnings for units equipped with A2L gas

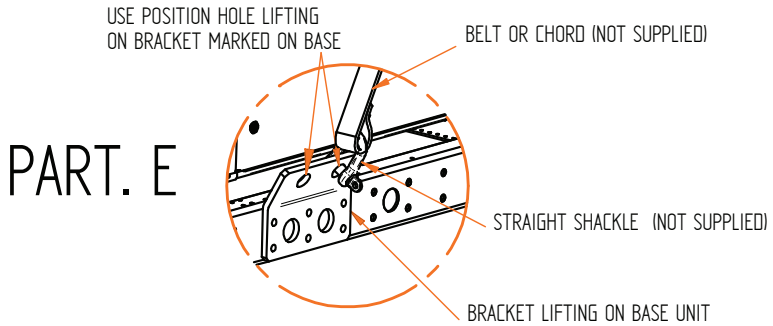
STORAGE

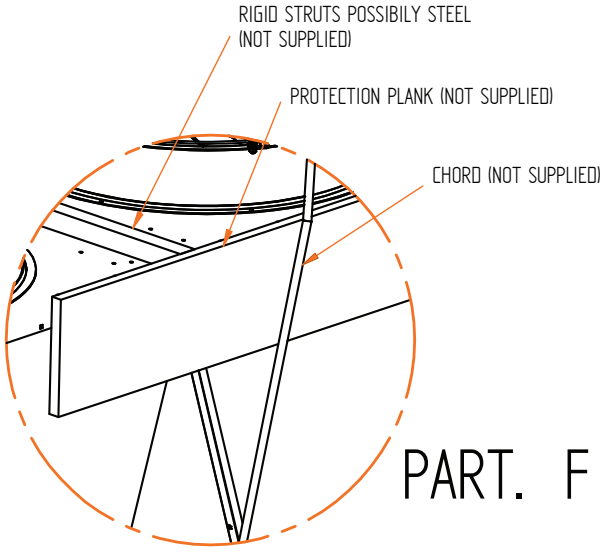
- Storage must only take place outdoors and away from any opening or downward compartment (for a list of examples see *8. Installation*) and from electrical or mechanical devices (such as forklifts, trucks, etc.) that can generate ignition sources.
- It is absolutely forbidden to exceed the indicated thermal limits - both maximum and minimum - to avoid any leakage from the safety valves and to avoid depression inside the refrigeration circuit that could cause oxygen to enter.
- If it is impossible to observe these requirements, it is mandatory to remove the gas contained in the unit by a qualified technician; contact Vertiv™ or its representative.

7.4 Transport

Lifting instructions with 4 brackets (10-12 fans)




USE POSITION HOLE LIFTING
ON BRACKET MARKED ON BASE
BELT OR CHORD (NOT SUPPLIED)
PART. E
STRAIGHT SHACKLE (NOT SUPPLIED)
BRACKET LIFTING ON BASE UNIT



The capacity of the lifting gear must be adequate to lift the load in question.

Check the weight of the units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment.

Lift the unit with a speed suitable for the load to be moved, so as not to damage the structure unit.

After lifting and positioning the unit, remove lifting accessories (ropes, slings, chains, hooks, brackets).

Lifting tools as hooks, lifting gear, ropes, chords, belts, rigid struts, protection plank are not provided with the unit.

Models	Fans n.	A (mm)	B (mm)	C (mm)
FIZ/NIZ/CIZ 065-075 FH4/NH4/CH4 065-075	10	~2800	~5000	~10000
FIZ/NIZ/CIZ 080-085 FH4/NH4/CH4 080-090	12	~2800	~5000	~10000

1. Insert a sling in each of the iron beams.
2. Use a crane to move the unit.

NOTICE

Do not use a forklift to move the unit. The structure does not support heavy loads and would be damaged.

NOTICE

Lift the unit with a speed suitable for the load to be moved, so as not to damage the structure.

- If the unit is shipped with a container, for extraction, follow the instructions on the front panel;
- Move the unit by lifting it from above with a crane;
- The holes for lifting are positioned on special yellow brackets fixed to the base frame (when lifting, use spreader bars to protect the side.

The lifting capacity of the lifting parts must be adequate for the load to be lifted. Check the weight of the units, the capacity of the sling bar and the ropes, the validity and the conditions of the aforementioned equipment.

Do not tilt the unit more than 15°.

No force or effort must be applied to pressurized parts, especially via pipes connected to the condensers or to the evaporator.

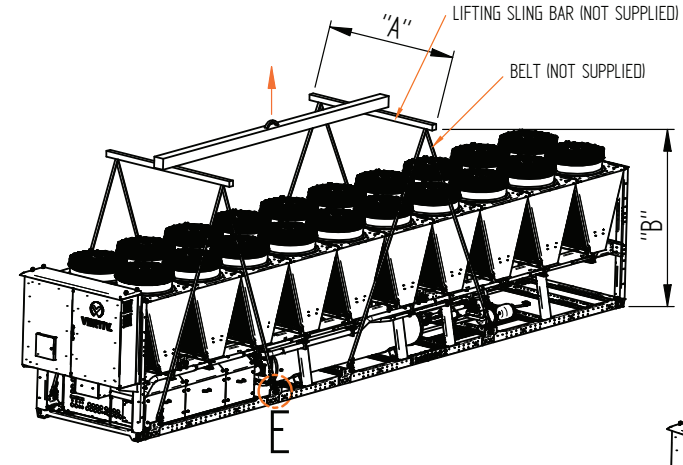
WARNING

The lifting point must be aligned with the gravity center.

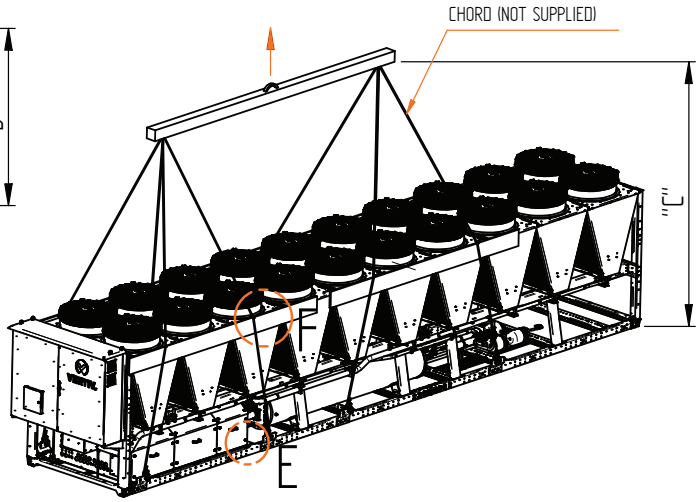
- Make reference to *Annex I - Dimensions and Weights* for dimensions, weight and gravity center position.
- If the unit is still packaged, pay attention to the gravity center and warning labels placed on the unit.

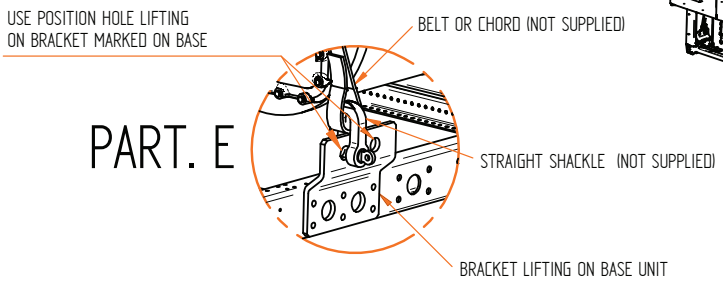
Lifting instructions with 8 brackets (14-16-18-20 fans)

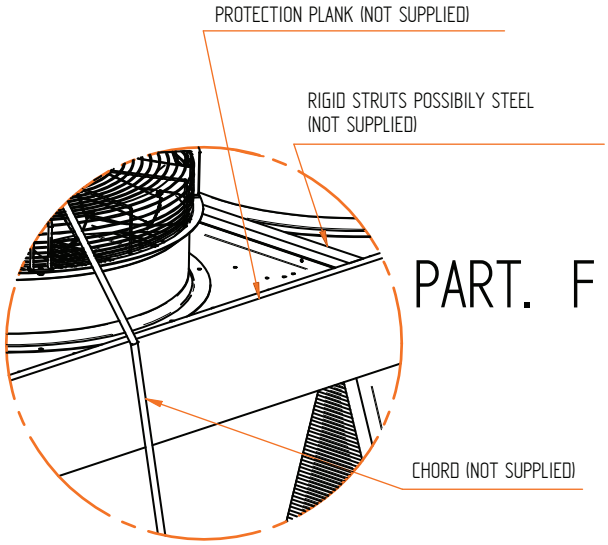
LIFTING WITH BELTS



LIFTING WITH CHORDS




USE POSITION HOLE LIFTING
ON BRACKET MARKED ON BASE
BELT OR CHORD (NOT SUPPLIED)
PART. E
STRAIGHT SHACKLE (NOT SUPPLIED)
BRACKET LIFTING ON BASE UNIT



The capacity of the lifting gear must be adequate to lift the load in question.

Check the weight of the units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment.

Lift the unit with a speed suitable for the load to be moved, so as not to damage the structure unit.

After lifting and positioning the unit, remove lifting accessories (ropes, slings, chains, hooks, brackets).

Lifting tools as hooks, lifting gear, ropes, chords, belts, rigid struts, protection plank are not provided with the unit.

Models (* = 4 x R134a, 3 x R513A)	Fans n.	A (mm)	B (mm)	C (mm)
FIZ/NIZ/CIZ 095-110 FH*/NH*/CH* 100-110	14	~2800	~5000	~10000
FIZ/NIZ/CIZ 125 FH*/NH*/CH* 125-140	16	~2800	~5000	~10000
FIZ/NIZ/CIZ 140 FH*/NH*/CH* 165	18	~2800	~5000	~10000
FIZ/NIZ/CIZ 150 FH*/NH*/CH* 180-195	20	~2800	~5000	~10000

1. Insert a sling in each of the iron beams.
2. Use a crane to move the unit.

NOTICE

Do not use a forklift to move the unit. The structure does not support heavy loads and would be damaged.

NOTICE

Lift the unit with a speed suitable for the load to be moved, so as not to damage the structure.

- If the unit is shipped with a container, for extraction, follow the instructions on the front panel;
- Move the unit by lifting it from above with a crane;
- The holes for lifting are positioned on special yellow brackets fixed to the base frame (when lifting, use spreader bars to protect the side.

The lifting capacity of the lifting parts must be adequate for the load to be lifted. Check the weight of the units, the capacity of the sling bar and the ropes, the validity and the conditions of the aforementioned equipment.

Do not tilt the unit more than 15°.

No force or effort must be applied to pressurized parts, especially via pipes connected to the condensers or to the evaporator.

WARNING

The lifting point must be aligned with the gravity center.

- Make reference to *Annex I - Dimensions and Weights* for dimensions, weight and gravity center position.
- If the unit is still packaged, pay attention to the gravity center and warning labels placed on the unit.

8. Installation

NOTICE

The installation of the unit must comply with EN378-3.

The refrigerant R1234ze falls into refrigerant safety group A2L in accordance to ISO-5149 and to EN-378 instead R134a and R513A are A1.

The **AFC** liquid chillers are classified as “indirect vented closed system” according ISO-5149 and EN-378 and are designated to be installed in a location class III (open air) with occupancy access category Class C (as per ISO-5149 and EN-378) where only authorized personnel have access; with these limits for both A1 and A2L refrigerant gas there aren’t any charge restriction. This limitation must be managed by the customer.

Please refer to these standards for further details. This level needs to be confirmed by the customer.
The A2L chiller(s) should be installed away from medium-high voltage power lines in accordance with local safety regulations.
The A2L chiller(s) should be at least **5** m from drains, manholes and should be in an area with free airflow.
During installation, the risk that any gas leaks, being heavier than air, will create pockets in compartments, rooms, chambers, tunnels or other spaces placed below the laying level of the machine must be taken into consideration.
To prevent the risk of potentially explosive bags from forming, safety distances must therefore be maintained from any opening in which gas may enter as a result of a leak from the various points of the machine.

By way of example, the possible openings that may be present in “standard” installations are listed:

- Culverts
- Downspouts
- Burrows
- Sewer openings
- Underground or basement rooms
- Windows
- Skylights
- Vent openings of bathrooms
- Ventilation and/or ventilation ducts
- Air intakes
- Access doors to rooms below
- Stairwells
- Elevator and / or elevator compartments
- Gutters

To determine the exact safety distance to be maintained, appropriate assessments must be conducted by the installer technician who must refer to the national legislation of the country of installation and in any case must not maintain distances of less than **5** meters from these openings.

8.1 Overview

8.1.1 Preparation of the installation site (by the customer)

NOTICE

Vertiv™ takes no responsibility for systems not compliant with the specifications given in this manual.
Lack of compliance to the specifications given by Vertiv™ voids the warranty.

The customer is responsible for the following operations.

Operation	See ...
Prepare the area	*8.3 Installation Site*
Prepare the water system	*8.4 Water System Specification*
Prepare the electric system	*8.5 Electric System Specifications*

8.1.2 Operations on the unit

The unit is delivered fully factory assembled, including all the internal wiring.
Before shipment each unit is tested under standard operating conditions and charged with the right quantity of refrigerant and oil. Operational or environmental conditions on field that differ significantly from standard ones may require charge adjustment.
The heat exchangers (evaporator and water coils) are supplied dry, with open drain plugs and exhaust valves, to avoid possible problems due to the frost in the storage period.

The following operations must be performed on the **Liebert® AFC** unit at the installation site:

Operation	See ...
1. Position the unit in the final location and fix it on the floor or on supporting structure	*8.3.2 Foundations and positioning*
2. Connect the water system to the unit	*8.6 Connections* - *8.6.1 Water system piping*
3. Connect the electric power supply	*8.6 Connections* - *8.6.2 Electrical power supply*
4. Connect the electric equipment to the electric box (optional connections)	*8.6 Connections* - *8.6.3 Ethernet cable connection* - *8.6.4 Contacts for the unit status signals* - *8.6.5 Instrumentation connection*
5. Connect the discharge of the safety valves	*8.6 Connections* - *8.6.6 Safety accessories: safety valves discharge (PRV)*
6. Fill the water system	*8.7 Filling the Water System*
7. Check the system	*8.8 Initial Checks*
8. Start the unit for the first time	*9. Operation*
9. Check or set up the operating parameters of the control system	*Vertiv™ iCOM3™ User Manual*

8.2 Safety Instructions

Personnel

WARNING

Only authorized personnel is allowed to perform installation operations.

All work on pipes or components of the refrigerating circuit under pressure must be exclusively made by qualified staff, competent in such works.

The authorized personnel must be properly trained and qualified, wear appropriate personal protective equipment and use adequate tools.

Electric System

WARNING

Unit contains potentially lethal voltage in some circuits.

Risk of arc flash and electric shock.
Can cause injury or death.

- Open all local and remote unit electric power disconnect switches, verify with a voltmeter that power is **OFF** and wear protective equipment per local standard before working within the electric control enclosure;
- It is forbidden to operate on the electrical components without using insulating platforms, or in the presence of water and humidity.

WARNING

The electric connection enclosures and some components can retain a stored high-voltage electrical charge for up to **10** minutes.

Risk of electric shock.
Can cause serious injury or death.

Before working within the unit electric connection enclosures proceed as follows:

- open all local and remote unit electric power disconnect switches;
- wait **10** minutes;
- verify with a voltmeter that power is **OFF**.

Only properly trained and qualified personnel may perform repair, maintenance and cleaning.

Lockout-Tagout (LOTO)

WARNING

Before any intervention on the electrical system or accessing the inner components:

- Lock the disconnection devices by a padlock or similar tool;
- Apply on the general knife switch a suitable warning plate for no operation.

Safeguards

CAUTION

After the installation interventions, always close the unit by refitting the relevant panels, if present, fastened by the fixing screws.

PPE

CAUTION

Sharp edges, splinters and exposed fasteners.

Wear protective gloves before operating on the unit.

NOTICE

Improper handling can cause product damage.

8.3 Installation Site

8.3.1 Location

- The **Liebert® AFC** units must be installed outdoors.
- Prepare a level surface suitable to support the weight of the **Liebert® AFC** unit.
- The unit produces heat. The installation site must have a good air flow to guarantee heat dispersion even in the most demanding operating conditions.
- Install the unit in an area with clean air, away from loose dirt and foreign matter.
- Earthquake resistance has not been verified.

8.3.2 Foundations and positioning

- The unit must be placed on a level surface which support its weight.
- If necessary, place the unit on suitable anti-vibration mounts, which can be supplied (in rubber or spring) as an option.

CAUTION

- Place the anti-vibration mounts on the ground, lower the unit onto them and fix them to the unit;
- See the manual “Installation of anti-vibration mounts a spring” for correct positioning;
- The group must be level positioned .

CAUTION

The weight distribution refers to standard unit only. The weight of accessories (eg pump groups) must be added to the weight of the unit.

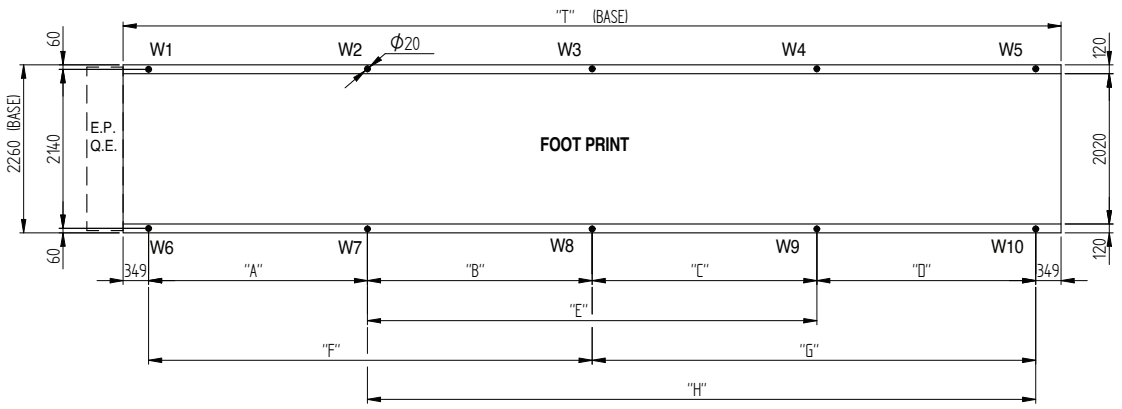


Table 61 - Position of Anti-vibration supports

CH3/4 - FH3/4 - NH3/4	065-075	080-090	100-110	125-140	165	180-195
CIZ - FIZ - NIZ	065-075	080-085	95-110	125	140	150
N° Fans	10	12	14	16	18	20
N° Antivibration	6	6	8	8	10	10
"A" (mm)	2286	3556	2286	3556	2286	2286
"B" (mm)	-	-	3810	3810	2540	2540
"C" (mm)	-	-	-	-	3810	3810
"D" (mm)	-	-	-	-	2286	3556
"E" (mm)	-	-	-	-	6350	6350
"F" (mm)	-	-	6096	7366	4826	4826
"G" (mm)	-	-	2286	2286	6096	7366
"H" (mm)	3556	3556	6096	6096	8636	9906
"T" (mm)	6540	7810	9080	10350	11620	12890

Table 62 - *H4/*H3 Operating weight distribution (Unit without user pump)

Models	Weight distribution (kg)										Total weight (kg)
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	
CH4/CH3 065	913	1590	--	--	362	1177	2050	--	--	467	6556
CH4/CH3 075	916	1597	--	--	363	1184	2063	--	--	469	6588
CH4/CH3 080	1102	1813	--	--	215	1408	2317	--	--	274	7130
CH4/CH3 090	1110	1825	--	--	213	1420	2335	--	--	272	7181
CH4/CH3 100	805	1856	996	--	291	1135	2615	1404	--	410	9512
CH4/CH3 110	882	1992	1017	--	298	1218	2748	1403	--	412	9971
CH4/CH3 125	1353	2067	782	--	246	1847	2823	1068	--	336	10517
CH4/CH3 140	1390	2117	790	--	248	1900	2893	1080	--	338	10752
CH4/CH3 165	984	1749	1172	967	146	1367	2432	1629	1344	202	11993
CH4/CH3 180	1073	1903	951	1074	347	1476	2617	1308	1476	477	12698
CH4/CH3 195	1072	1900	959	1072	346	1478	2620	1321	1478	477	12723
FH4/FH3 065	1142	2250	--	--	615	1218	2400	--	--	655	8275
FH4/FH3 075	1146	2258	--	--	614	1224	2412	--	--	656	8307
FH4/FH3 080	1438	2597	--	--	445	1502	2713	--	--	465	9159
FH4/FH3 090	1447	2610	--	--	443	1513	2730	--	--	463	9210
FH4/FH3 100	1034	2564	1606	--	459	1177	2918	1826	--	522	12106
FH4/FH3 110	1114	2706	1621	--	465	1257	3054	1830	--	525	12565
FH4/FH3 125	1667	2970	1464	--	265	1853	3300	1626	--	295	13437
FH4/FH3 140	1704	3012	1468	--	268	1907	3370	1643	--	300	13672
FH4/FH3 165	1294	2329	1696	1540	305	1446	2601	1894	1720	341	15171
FH4/FH3 180	1323	2408	1723	1732	528	1457	2652	1898	1908	582	16191
FH4/FH3 195	1322	2405	1725	1730	528	1459	2655	1905	1910	582	16214
NH4/NH3 065	1107	2319	--	--	677	1233	2581	--	--	753	8664
NH4/NH3 075	1111	2326	--	--	676	1239	2594	--	--	754	8696
NH4/NH3 080	1440	2768	--	--	564	1520	2922	--	--	596	9816
NH4/NH3 090	1454	2781	--	--	564	1536	2939	--	--	596	9867
NH4/NH3 100	1021	2665	1823	--	517	1171	3057	2090	--	594	12938
NH4/NH3 110	1100	2804	1840	--	524	1252	3188	2092	--	598	13398
NH4/NH3 125	1683	3143	1654	--	260	1888	3528	1857	--	291	14300

NH4/NH3 140	1724	3188	1653	--	261	1947	3602	1868	--	295	14535
NH4/NH3 165	1282	2368	2321	1761	224	1398	2582	2530	1919	245	16621
NH4/NH3 180	1336	2487	2376	1926	471	1425	2654	2535	2055	502	17774
NH4/NH3 195	1334	2490	2383	1928	471	1426	2661	2547	2062	502	17798

Table 63 - *IZ Operating weight distribution (Unit without user pump)

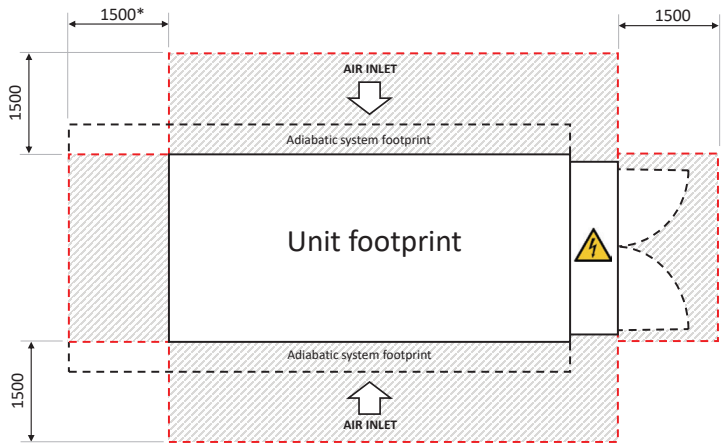
Models	Weight distribution (kg)										Total weight (kg)
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	
CIZ 065	717	1460	--	--	412	913	1860	--	--	525	5892
CIZ 075	721	1465	--	--	412	919	1865	--	--	525	5902
CIZ 080	1055	1774	--	--	232	1365	2296	--	--	300	7029
CIZ 085	870	1985	--	--	431	1150	2625	--	--	569	7629
CIZ 095	797	1848	1008	--	295	1094	2534	1384	--	404	9364
CIZ 110	873	1967	1002	--	294	1227	2763	1408	--	412	9940
CIZ 125	1339	2045	774	--	243	1862	2844	1076	--	339	10518
CIZ 140	967	1721	1168	963	146	1343	2390	1622	1337	203	11860
CIZ 150	1027	1823	956	1074	347	1413	2507	1314	1476	477	12409
FIZ 065	937	2124	--	--	672	973	2206	--	--	698	7612
FIZ 075	937	2129	--	--	672	973	2211	--	--	698	7622
FIZ 080	1398	2576	--	--	470	1462	2694	--	--	492	9098
FIZ 085	1425	2706	--	--	539	1535	2914	--	--	581	9697
FIZ 095	1023	2557	1619	--	462	1138	2844	1801	--	514	11958
FIZ 110	1106	2683	1601	--	460	1264	3067	1829	--	525	12535
FIZ 125	1655	2948	1458	--	263	1865	3322	1642	--	297	13438
FIZ 140	1277	2300	1690	1537	307	1423	2561	1882	1713	341	15037
FIZ 150	1221	2332	1779	1726	530	1339	2558	1951	1894	581	15901
NIZ 065	899	2191	--	--	737	981	2389	--	--	803	8000
NIZ 075	904	2192	--	--	737	986	2388	--	--	803	8010
NIZ 080	1392	2725	--	--	582	1478	2895	--	--	618	9699
NIZ 085	1420	2854	--	--	650	1550	3116	--	--	710	10299
NIZ 095	1008	2657	1842	--	519	1132	2983	2068	--	582	12791
NIZ 110	1092	2785	1822	--	516	1258	3205	2098	--	594	13367
NIZ 125	1675	3131	1652	--	257	1905	3560	1878	--	293	14350
NIZ 140	1213	2344	2329	1735	231	1318	2548	2531	1886	251	16388
NIZ 150	1229	2394	2370	1896	474	1311	2555	2530	2024	506	17285

CAUTION

The operationing distribution refers to the base version of the unit; the weight of unit options (e.g user pump groups) can be considered as equally distributed over the supports and must be added to the total unit weight.
Please refer to the unit nameplate for the exact weight value.

8.3.3 Space Requirements

- To allow proper operation and maintenance of the unit, a minimum free space without any obstacles/ obstructions is necessary according to the figure below.
- The hot air expelled by the fans must not find obstacles for a height of at least **2.5** m.
- The installer shoud carefully evaluate the overall airflow path on the site, particularly in case of multi-chiller installations, ensuring that each unit works with the required airflow and avoiding any air bypass between discharge and suction side of the units.
- Hot air bypasses could negatively affect the unit performances or even interrupt its normal operation.



(*) Could be reduced to 1000 according to the specific unit configuration

Free space / mainteinance area

- See *Annex I - Dimensions and Weights* for the unit dimensions.
- The unit has to be installed in a place that is not accessible to the public or protected against access by non-authorized persons.
- The unit environment must permit easy access for maintenance operations.

NOTICE

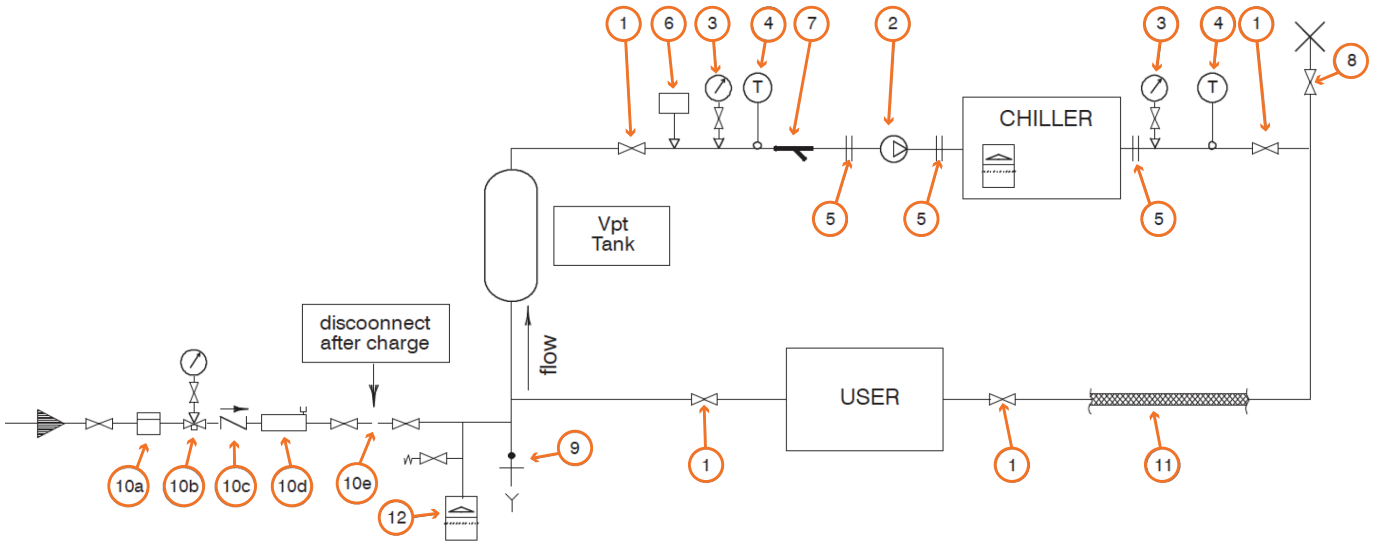
The maintenance of the unit become extremely difficult if placed too close to walls or other obstacles.

The floor level in the maintenance area on the electrical panel side must be aligned with the surface where the unit is placed, ensuring easy and safe access to the electrical panel, complying with applicable safety regulations.

8.4 Water System Specifications

8.4.1 Ideal water circuit

The **Liebert® AFC** unit must be connected to the chilled water circuit.
The customer is responsible for the water circuit, according to the following example and specifications.
The following figure shows an ideal circuit for the evaporator (chilled water).



Ref.	Description	Notes
1	**Shut-off valves**	Install shut-off valves to facilitate maintenance. Do not install on the water outlet motorized shut-off valves configured as normally closed in stand-by status, because of the presence of check valves inside chiller on pump delivery. On the contrary, it is possible to install these motorized valves on the water inlets.
2	**Pump**	Install a circulation pump with the flow required by the plant and the head of all pressure drops of the plant including the chiller ones. It's possible to provide the pump(s) group fitted on chiller.
3	**Manometers**	Install manometer to the inlet and outlet of the **Liebert® AFC**
4	**Temperature probes**	Install temperature probes to the inlet and outlet of the **Liebert® AFC**.
5	**Joints**	Piping connected to the **Liebert® AFC** shall be properly externally supported and shall in no way burden statically on the chiller connections. Flexible joints shall be used in order to avoid vibration transmission and thermal expansion issues.
6	**Pressure switch**	Install a pressure switch on water pipe to give an early warning of low water pressure.
7	**Filter**	Install mechanical filter at the inlet of the pump and at the inlet of the **Liebert® AFC** It can be supplied as an optional accessory, not assembled. If the fluid contains particles larger than 1 mm (0.04 inches), it is advisable to fit a filter with mesh size of maximum 0.87 mm, is at least 25 mesh (number of openings per inch).
8	**Filling and venting devices**	Install a device for the filling of glycol, placed at the highest points in the circuit. Install a device for the bleeding of air, placed at the highest points in the circuit. For A2L units it's mandatory to install a device for the bleeding of air according 5.5.2.1 of EN 378-1
9	**Drain valve**	Install a drain valve, placed at the lowest points in the circuit.
10	**Water fill**	Install a water fill group including the following components: a) filling meter b) manometer c) non return valve d) air separator e) removable supply tube, which must be disconnected after each charge or topping up
11	**Insulation**	All pipes of the system exposed to low temperature have to be isolated. Also consider to use heaters, if necessary.
12	**Expansion tank**	The circuit must include an expansion tank with suitable capacity. See *8.4.2 Sizing of the expansion tank* for the capacity calculation. **Install a safety valve on the expansion tank.**

8.4.2 Sizing of the expansion tank

$$V = \frac{C \times e}{1 - \frac{Pi}{Pf}}$$

where:

C = quantity of water inside the system expressed in liters;
e = water expansion coefficient, water at 10°C as reference;
Pi = absolute pressure of initial charging, equivalent to the tank pre-charge pressure (value 2.5 bar);
Pf = absolute final tolerated pressure, lower than the operating pressure or than the safety valve calibration pressure (value 4.0 bar).

The total volume of the expansion tank is calculated with the ratio shown on the left.

Use the values of the water expansion coefficient indicated in the table below:

T [C°]	Density [Kg/m^3]	Expansion coefficient "e" H_2O	"e" 10% glycol	"e" 20% glycol	"e" 30% glycol	"e" 40% glycol	"e" 50% glycol
10	999,6	0,001	0,003	0,005	0,007	0,013	0,015
20	997,9	0,002	0,005	0,008	0,01	0,015	0,018
30	995,6	0,004	0,007	0,011	0,013	0,017	0,02
40	992,2	0,008	0,011	0,014	0,016	0,021	0,024
50	988,1	0,012	0,015	0,018	0,021	0,025	0,028

8.4.3 Sizing of the chilled water circuit

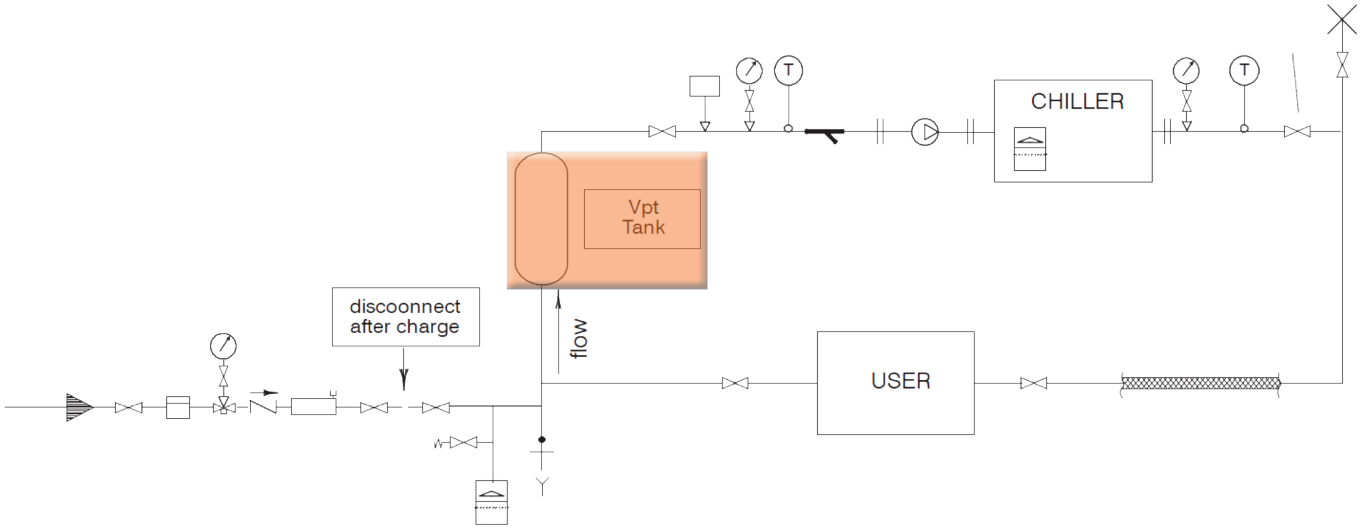
NOTICE

Check if the minimum total volume (**V**) of the system is sufficient to avoid less than **5** minute water loop circulation in order to prevent short water loop.

For variable flow systems, consider the nominal water flow.

For units with fixed flow option, the hydraulic circuit must guarantee the constant flow of water to the evaporator in all operating conditions. Failure to do so could cause breakages of the compressors due to repeated returns of liquid refrigerant.

Whenever two or more units are used on the same chilled water loop, Vertiv™ recommends that their operation be coordinated with a higher-level system controller for optimum system efficiency and reliability.



The whole hydraulic circuit must contain a water volume suitable for the capacity of the installed refrigerating unit. The minimum total volume (**V**) of the system where the **Liebert® AFC** is installed can be calculated by the following ratio:

$$\mathbf{V} = \frac{43 \times \mathbf{Rt}}{\mathbf{Xd}}$$

where:

V = minimum required total water volume [liters]
Rt = refrigerating capacity [kW]
Xd = differential band set on the control [°C]

Check if:

$$\mathbf{Vm} + \mathbf{Vpc} \geq \mathbf{V}$$

where:

Vm = hydraulic volume of the evaporator of the **Liebert® AFC** unit
Vpc = volume of the water circuit connected to the **Liebert® AFC**

If **Vm** + **Vpc** < **V** then install an inertial tank with a volume (**Vpt**) at least equal to the following value:

$$\mathbf{Vpt} = \mathbf{V} - \mathbf{Vm} - \mathbf{Vpc}$$

8.4.4 System protection

Flow-switch

Normal operation:

1. The water pumps start.
2. There is water flow in the system.
3. The compressors start.
4. The compressors operate only if there is enough water flow in the system.

In case of pumps failure:

- The compressors must not start if there is no water flow in the system.
- The **Liebert® AFC** has factory mounted protections (flow switch) in case of lack of water flow in the evaporator.
- The **Liebert® AFC** has a protection in case of lack of not sufficient water pressure if pump(s) group is installed on board: this is to avoid pump's cavitation and or depressurization of the chiller hydraulic circuit.
- The **Liebert® AFC** has a protection for variable flow systems: it's monitored and controlled the min e max flow and its gradient (< 10% by minute);

Max. hydraulic operating pressure

The maximum hydraulic operating pressure of the **Liebert® AFC** is 10 barg.

- Check how much is the maximum pump static head (**Pp**) (indicated on pump's name plate).
- Check the static head of the water circuit (**Pw**).
- Make sure that it is always: **Pp** + **Pw** < 10 barg.

Optional: install on the water circuit an expansion tank of 12 (+12) lt, according unit model and a safety valve set at 6 barg.

8.4.5 Water supply specifications

Analyze the water

It is the user's responsibility to establish the quality of the water and make sure that this is compatible with the materials used in the exchangers.

The quality of water significantly affects the operation and the life of the exchangers.

The first step in planning the treatment of the water is chemical analysis, which must be performed by qualified personnel from specialist organizations.

Water quality has to be in accordance with VDI 2035.

Add water softeners

In tower water, the tendency to form deposits may be high: to reduce this phenomenon, there are various types of water softening treatments available, including the use of ion exchange resins.

Prevent corrosion

The oxygen dissolved in water increases the rate of corrosion.

The main factors causing corrosion are sulphur and carbon dioxide acids (see the Langelier and Ryznar indices).

A combined effect of fouling due to dust and organic material provides a support for bacteria, fungi and algae; the growth of organisms may produce an oxygen gradient and this results in rather severe pitting of the metallic surface.

The phenomenon of corrosion is obviously related to the material used on the liquid side of the heat exchanger.

The table on the right shows the reference values for corrosion on copper, these values must be considered as guidelines to avoid corrosion.

pH	---	7,5 - 9,0
Alkalinity (HCO_3^-)	ppm	70 - 200
SO_4^{2-}	ppm	< 100
HCO_3^- / SO_4^{2-}	---	> 1,5
(Ca+Mg)/(HCO_3^-)	---	> 0,5
Cl^-	ppm	< 100
PO_4^{3-}	ppm	< 2,0
NH_3	ppm	< 0,5
Nitrate(NO_3^-)	ppm	< 100
Free Chlorine (Cl_2)	ppm	< 1
Iron Fe^{3+}	ppm	< 1
Copper Cu	ppm	< 1
CO_2	ppm	< 10
H_2S	ppb	< 50
Oxygen content	ppm	< 0,1
Total Suspended solids	mg/l	< 1500
Electric conducibility	µS/cm	10 - 500
Total hardness	dH	4,0 - 8,5

8.4.6 Filling the hydraulic circuit with water or glycol mixtures

In chillers or freecooling chillers having A2L gas during the first hydraulic loading of the system (or in case of maintenance - restoration of hydraulic circuit filling following refrigerant leaks from the refrigerant circuit) it is mandatory to analyze with a gas detector (having a sensitivity of 3 gr / year) the air leaving the vents positioned on the highest parts of the FC exchangers and the circuit, detecting the absence of any trace of refrigerant.

In Glycol Free Freecooling chillers these operations are limited to the evaporator hydraulic circuit (no checks are needed on the vents of the freecooling exchangers as they are double isolated from the refrigerant circuit thanks to the intermediate exchanger).

8.4.7 Filling the Glycol Free hydraulic circuit with glycol mixtures

The glycol free circuit consists of:

- one or more intermediate plate heat exchangers;
- finned free cooling exchangers with copper pipes (coils) or totally in aluminum (microchannel);
- one or more inverter pump for the circulation of the glycol fluid;
- shut-off and anti-recirculation check valves;
- circuit with connection pipes;
- expansion vessels, safety valves, filling outlets, vents and drains;
- transducers for pump regulation and safety;
- high efficiency mechanical filter (mesh >100) to protect the exchangers (present only with microchannel freecooling exchangers);
- heating elements on the water side to avoid freezing during the stand by unit.

This circuit must be loaded with the correct percentage of glycol to avoid freezing.

The glycols must be compatible with the materials of the circuit itself, in particular in the presence of microchannel freecooling exchangers, must have the correct corrosion inhibitors and be compatible with the aluminum alloys used in them Vertiv™ suggests the use of glycol mixtures with Clariant Antifrogen N (monoethylene) or Clariant Antifrogen L (propylene).

The loading procedure must be carried out slowly paying attention to properly vent the whole circuit; avoid operating the pump or if necessary at minimum speed in order to avoid the onset of foams in the presence of glycol which greatly lengthen the time for the elimination of air from the circuit.

The circuit must then be correctly pressurized by loading the expansion vessels, 2.5 Barg is recommended as a reference value.

To load the fluid in the circuit in the presence of microchannel freecooling exchangers.

1. Use the connection prepared for loading, open the vents and intercept the butterfly valve: in this way you are sure that all the fluid passes through the filter.
2. After having vented and removed all the air, start the pump at minimum speed and proceed by opening the vents to remove the residual air pockets.
3. After having circulated the fluid for at least **10** minutes, turn off the pump, intercept the filter and remove the residues on the magnet and clean and / or replace the filter sock; recharge the system and proceed according to points two and three until all the residues are eliminated and the sock is clean.
4. During these operations, pay attention to flush the filter only if the circuit is fully loaded, avoid accelerating the pump in the presence of bubbles, avoid opening, closing valves and causing water hammers on the filter itself: this avoids producing breakages and / or lacerations on the shirt of the same.
5. Pressurize the circuit by loading the expansion vessels, gradually accelerate the pump to the maximum speed allowed by the control, check correct operation.

Microchannel freecooling exchangers require some special attention for their use:

- The glycol mixtures must be derived from glycols with anti-corrosion inhibitors compatible with the aluminum alloys used in them.
- The PH of these mixtures must be periodically checked, which must always be in the range between **7.5** and **8.2.**
- There must be no presence of oxygen in the circuit so it must be perfectly vented.

  - For this purpose, the unit controller has a pump suction pressure sensor which warns if the circuit approaches depressed conditions (situation in which the pump can suck air); in these cases it is recommended to check the integrity of the circuit, of the expansion vessels and of their correct pressurization.
- Speeds on the exchanger channels greater than 1.4 m / s must not be exceeded to avoid deterioration of erosion.

  - For this purpose, the unit controller has a pair of pressure sensors that verify the dangerous pressure drop conditions of the circuit corresponding to the prescribed speeds, limiting (if necessary) the maximum pump speed.

8.4.8 Prevent freezing for chiller or freecooling chiller

Prevent freezing by glycol

In winter, if the system is stopped, the water inside the exchangers can freeze damaging the system irreparably.

Thus, it is recommended to use glycol mixtures: please consider the different outputs and power absorption by the chiller, the pump sizing and the performance of the system terminals/ conditioners).

After any topping-up of water check the concentration and add glycol if necessary.

Water-glycol mixtures are used as the thermal carrier fluid in very cold climates or with temperatures below zero degrees centigrade.

Determine the % ethylene glycol which must be added to the water, using the following table:

Tab. a - Ethylene glycol to be added to water (% in weight of total mixture)

Ethylene glycol [% in weight]	0	10	20	30	40	50
Freezing temperature,°C (*)	0	-4,4	-9,9	-16,6	-25,2	-37,2
Mixture density at 20°C (*) [kg/l]	---	1.017	1.033	1.049	1.064	1.080

(*) Values are for Clariant Antifrogen N. For different brands, check manufacturer's data.

For the water charges in the **Liebert® AFC** circuit refer to *6.2 Water System*

- To avoid stratification, run the circulation pump for at least **30** min. after each addition of glycol. If the pumps are installed on board the chiller, they must all be operated simultaneously.
- Flush all parts of the chiller hydraulic circuit including the free cooling batteries and the by-pass sections; to do this, manually move the 2-way valves to both positions, making the circuit flush for the necessary time.
- After adding water to the circuit, it is mandatory to disconnect the system from the sanitary water network; this will avoid the danger of the return of glycol water in the same network.
- After each top up of water, check the concentration and add glycol if necessary.

ALWAYS LOAD THE HYDRAULIC CIRCUIT WITH THE REQUEST % OF GLYCOL REQUIRED FOR THE MINIMUM AMBIENT TEMPERATURE OWN OF THE INSTALLATION SITE; DO NOT COMPLY WITH THIS REQUIREMENT MEANS INVALIDATE THE UNIT WARRANTY

To avoid stratification run the circulation pump for at least **30** minutes after adding any glycol.

After adding water to the hydraulic circuit always disconnected the water supply coming from the sanitary circuit; this avoids the danger of glycol entering the sanitary water circuit.

Water glycol fluid mixture has to be circulated inside the unit hydraulic parts including freecooling coils and by-pass pipes. In order to do it move the two 2-way valves on both positions for the time necessary.

NOTICE

Always charge the hydraulic circuit with the required glycol % necessary for the minimum ambient temperature of the installation site.

Failing to comply with this instruction shall invalidate the unit warranty.

Prevent freezing by draining

Otherwise drain the system completely, using the suitable shut-off valves arranged in the exchangers and in the circuit, trying to drain the water residues blowing air in the lines.

NOTICE

During the winter or in the event of plant shutdown, if you decide to completely empty the unit, the water in the exchangers can freeze causing irreparable damage, so it is advisable to flush the circuit with glycol mixtures before carrying out this operation; however residues of fluid in the exchangers in the presence of oxygen (air) can trigger deleterious corrosion phenomena, therefore it is recommended to flush the non-nitrogen anhydrous hydraulic circuit (N2) in order to dry it as much as possible and remove the oxygen present; after this operation, close the circuit, vents, drains making sure that no air returns into it.

8.5 Electric System Specifications

Power supply requirements for the unit

- Check the electrical data on the label applied on the unit.
- Check that the available power supply is consistent with the unit power requirements given in *6.4 Electrical System*.
- Refer to the electrical schematic supplied with the unit when making line voltage supply, low voltage main unit interlock and any low voltage alarm connections.

Local codes

- Electrical service must conform to national and local electrical codes.
- All wiring must be done in accordance with all applicable local, state, and national electrical codes.

Disconnecting switch and protection

- A manual electrical disconnect switch should be installed in accordance with local codes.
- Select and install the line side electrical supply wire and over current protection device(s) according to the specifications on the unit nameplate(s), according to the instructions in this manual and according to the applicable national, state, and local code requirements.
- The customer is responsible for the system protection.
- Protect the system by a differential switch.
- If the system includes pumps with inverter, then use a type B or B** switch.

Power supply variability

- Check that the maximum unbalance between the phases does not exceed the value given in *6.4 Electrical System*.
- Make sure to comply with the following data:
  - Electrical voltage between 0.9 and 1.1 nominal voltage;
  - Frequency between 0.99 and 1.01 the nominal frequency;
  - Variability of supply voltage less than 2%.

See the figure below for variability evaluation.

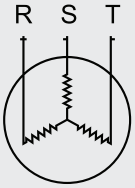
Example of calculating phase to phase variability

1) The 400 V supply has the following variability:

RS = 388 V

ST = 401 V

RT = 402 V



2) The average voltage is:

$$\frac{388 + 401 + 402}{3} = 397$$

3) The maximum deviation from the average is:

402 - 397 = 5 V

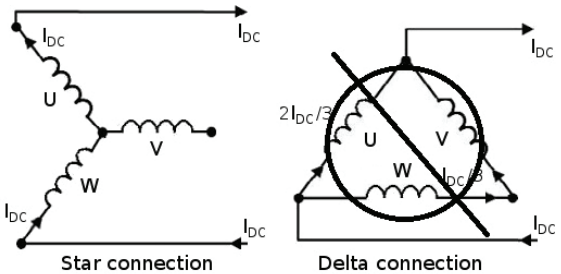
4) The phase to phase variability is:

$$\frac{5}{397} \times 100 = 1.26\% \text{ (acceptable)}$$

Power supply connection

The **Liebert® AFC** units are equipped with electrical devices (power supplies module, control devices, etc.) that are designed to operate properly with Star-connected power (Wye) with earthed neutral (TN or TT system).

Three-phase distribution Delta-connected (Δ) or Star-connected power (Wye) without ground or floating ground (IT) contact Vertiv™.



Supply voltage	Voltage interruption: interrupted or at zero voltage for not more than **3** ms at any random time in the supply cycle with more than **1** s between successive interruptions. Voltage dips not exceeding 20% of the rms voltage of the supply for more than one cycle with more than **1** s between successive dips.
Power supply type	**Acceptable:** - TT, TN-S, TN-C, TN-C-S systems; - 400V Wye with solidly grounded neutral (230V line to ground); **Unacceptable:** - 400 V Wye without ground connection or with high-resistance (or impedance) ground (IT); - 400 V Δ without ground or with high-resistance (or impedance) ground (IT); - 400 V Δ with corner ground or with grounded center-tapped.
Cables type	• Use copper wiring only; • Cable Sizing is responsibility of the installer. The units are equipped with electrical panel with one main switch for the power section and one switch (option) for the control section. Choose a supply cable (three-pole type with ground) for the power section and a supply cable (two-pole type with ground) for the control section (option) according to: - the local norms; - the system absorption (FLA unit); - the system voltage; - installation type; - cable length; - upstream protection.
Check integrity	• Make sure that all electrical connections are tight. • Make sure that all electrical components are undamaged.
Sealing	• When leading the cable through the joint, you are recommended to use the sealant for waterproof disposal. • If you do not follow the recommended cable sizes and mode to connect the cables, water leakage may occur at the waterproof joint.
Hot surfaces	• The cables cannot contact hot objects, such as the copper pipe and water pipe without thermal insulation pipe, lest the insulation layers should be damaged. • Before proceeding with the electrical connections, make sure that: - the electrical components are in good condition; - all the terminal screws are well tightened; - the supply voltage and frequency comply with those indicated on the unit and respect the tolerances indicated in the paragraph *6.3 Operating limits*; - the maximum balance between the phases does not exceed the value indicated in the paragraph *6.3 Operating limits*.

- Power cable connection:
  The units are equipped with an electrical panel equipped with a main disconnector that powers the entire unit and one that powers the control only (optional).
  Choose a power cable (three-pole with earth) for the power section and a power cable (bipolar with earth) for the control section (optional):
  - local regulations;
  - plant absorption (FLA unit);
  - system voltage;
  - type of laying;
  - cable length;
  - UPSTREAM protection.
- After opening the passage in the carpentry (pre-cut) for the power line input, restore the original degree of protection with appropriate wiring accessories and mittens. Lay the cable paying particular attention not to touch hot parts.

  Connect the cable to the input terminal block (terminals disconnectors for phases, earth bar for the PE conductor). Once the cable is connected, restore the protections against direct contacts.

3. The protection of the system / line cable is the responsibility of the customer. Use a differential switch protection. If the system is equipped with EC type fans and / or with inverter pumps, use a type B switch.

4. Ethernet cable connection.
The control can be connected to a remote display through an Ethernet network cable (see *HW User Manual*).
- Fasten the cable to the cable tie plates and pass it through the first free hole on the bottom of the switchboard (provide cable gland).
- After opening the passage in the carpentry (pre-cut) opposite the power line input, restore the original degree of protection with appropriate wiring accessories and mittens.
- The cable must be protected by a sheath.

5. Connection of free contacts signaling machine status.
The dry contacts can only be used with PELV type sources as described in the CEI EN 60204-1 standard "Safety of machinery - Electrical equipment of machines".
The table below shows the terminals available and their meaning (see the wiring diagram for further information).
The passage of the cable must be carried out as described in the previous point 4.

NOTE: *The power supply must never be excluded, except when performs maintenance. Operate the switch-disconnector before any intervention on electrically powered parts.*

NOTE: *It is forbidden to operate on electrical components without using insulating platforms and in the presence of water or humidity.*

NOTE: *The external pump unit must be powered before the chiller unit starts and must be maintained for the entire period of use; in fact, an incorrect operation locks the group due to internal protections (flow switch intervention).*

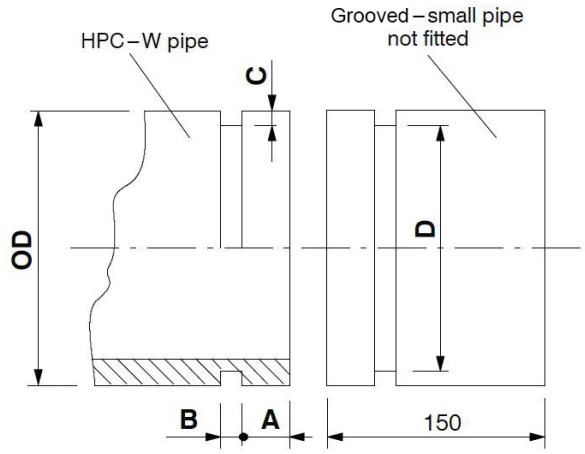
NOTE: *The compressors are equipped with an electronic protection device that blocks their start if the sequence of phases is not the correct one or blocks their operation if thermal protection intervenes; this device is vital for the integrity of the mechanical and electrical components of the compressors themselves. The restoration of normal functions must be carried out by removing the power supply to this device and removing the causes that caused the shutdown.*

NOTE: *The chillers are equipped with their own regulation with microprocessor control: the use of the remote ON-OFF (provided in the Q.E. terminal board) as a system thermostating element is prohibited.*

8.6 Connections

8.6.1 Water system piping

Joints



For welded hydraulic connection use the small pipes supplied with the unit, otherwise directly connect grooved lines with the grooved pipes connections joints of the unit, taking care to suitably grease the joint gaskets.

Ref.	Unit	Dimensions				
OD (Ø)	Inch	4”	5”	6”	8”	10”
	DN	100	125	150	200	250
	mm	114,3	139,7	168,3	219,1	273,1
A	mm	15,88	15,88	15,88	19,05	19,05
Tolerance on A	mm	± 0,77	± 0,77	± 0,77	± 0,77	± 0,77
B	mm	9,53	9,53	9,53	11,13	12,7
Tolerance on B	mm	± 0,77	± 0,77	± 0,77	± 0,77	± 0,77
C	mm	2,11	2,13	2,16	2,34	2,39
D	mm	110,08	135,50	163,96	214,40	268,27
Tolerance on D	mm	- 0,51	- 0,56	- 0,56	- 0,64	- 0,69
	mm	+ 0,00	+ 0,00	+ 0,00	+ 0,00	+ 0,00

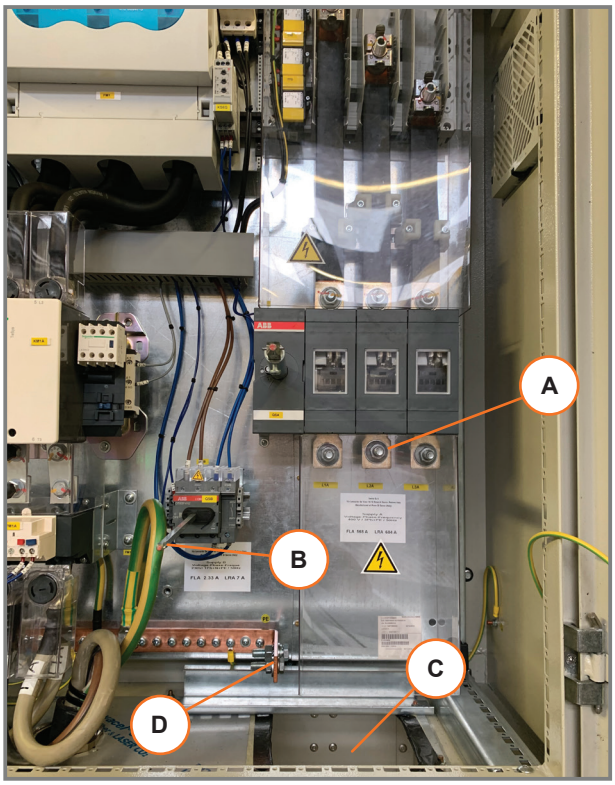
Vibration damping

Piping connected to the **Liebert® AFC** shall be properly externally supported and shall in no way burden statically on the chiller connections. Flexible joints shall be used in order to avoid vibration transmission and thermal expansion issues.

Use flexible joints also for the pump assembly outside the **Liebert® AFC**.

Isolate piping from the building using vibration isolating supports.

8.6.2 Electrical power supply



A	Power supply
B	Low voltage connection for the control system
C	Passage for cables
D	Protective Earth Connection

- After opening the passage in the structural works (precut), for the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.
- Install the cable avoiding carefully to touch the hot parts.
- Connect the cable to the inlet terminal board (disconnecting switch terminals for phases, ground bar for PE conductor).
- After having connected the cable, restore the protections against direct contacts.

The system/line cable protection is to be arranged by the customer.

Use a protection with differential switch.

NOTICE

The unit is equipped with its own microprocessor control adjustment. The use of the remote ON-OFF input (located in the electrical panel terminal board) as system temperature control element is forbidden

8.6.3 Ethernet cable connection

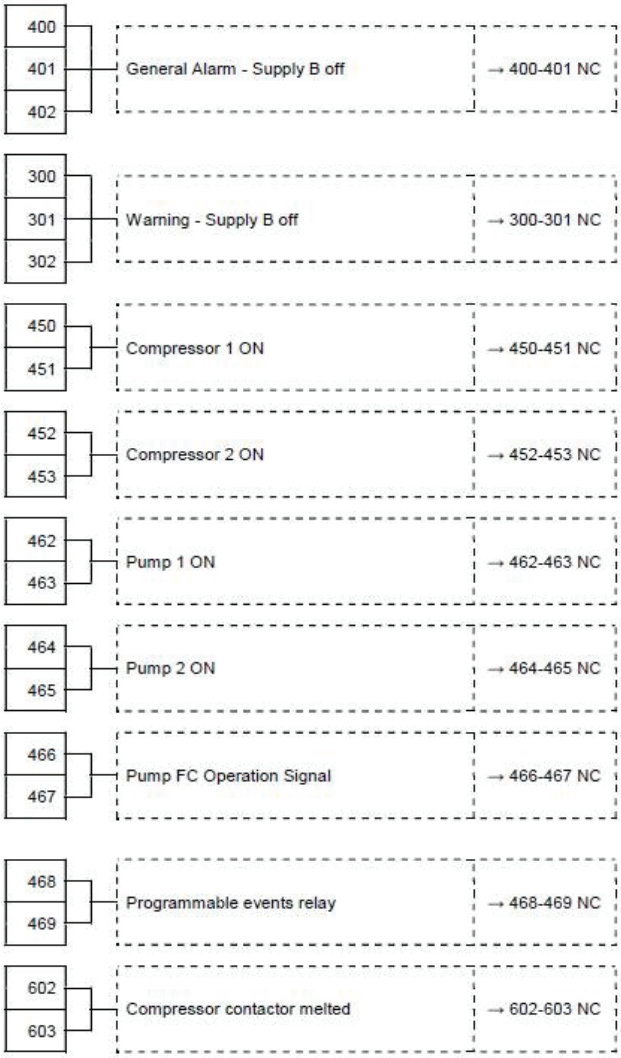
The control can be connected with a remote display through an Ethernet network cable (see *Vertiv™ iCOM3™ User Manual*).

- Fasten the cable to the clamp-holding plates and make it pass through the first free hole on the panel bottom (arrange a cable clamp).
- After opening the passage in the structural works (precut), opposite the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.

The cable must be protected by a sheath.

8.6.4 Contacts for the unit status signals

Free contacts available



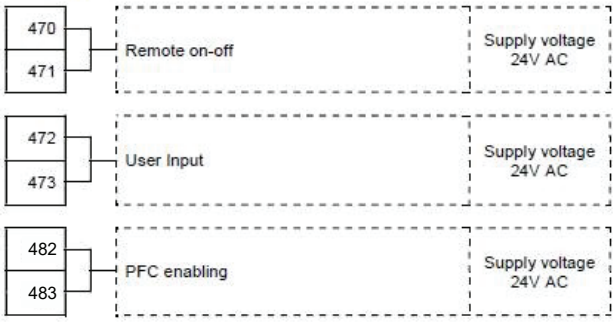
The clean contacts can be used only with PELV type sources, as described by the norm CEI EN 60204-1 “Safety of machinery - Electrical equipment of machines”.

The table on the left shows the available terminals and their meaning (refer to the wiring diagrams for further information).

- Fasten the cable to the clamp-holding plates and make it pass through the first free hole on the panel bottom (arrange a cable clamp).
- After opening the passage in the structural works (precut), opposite the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.

The cable must be protected by a sheath.

Input contact



8.6.5 Instrumentation connection

- Make reference to the *Electric Diagrams*.

8.6.6 Safety accessories: safety valves discharge (PRV)

Convey the discharge

Safety valves are installed on the refrigerating circuiton both on the high and low pressure sides. For all refrigerants the discharge connection of the valves must be conveyed to areas where the jet cannot harm people. The conveying pipe must be sized according EN13136, and must not burden the valve body. In particular, for A2L refrigerants the jet discharge of safety valves generates a classified ZONE 2 according ATEX EU Directive; for this reason, the discharge zone (better described below) must not present any source of ignition like:

- Open flames with Minimum Ignition Energy 60.000 mJ at 54°C and 1 atm;
- Electric arcs with Minimum Ignition Energy 60.000 mJ at 54°C and 1 atm;
- Hot surfaces at temperature t > 360°C;
- Other ignition sources listed in EN1127-1.

Each valve should preferably be connected individually with the discharge pipe sized according to EN13136. If several valves are conveyed together, the user must size the manifold according to EN13136 as well, in order to avoid harmful back pressure on the valves that have not opened. The conveying pipe of the PRV must have a suitable geometry, structure and materials in order to avoid:

- Its occlusion due to the entry of water or snow (which may freeze in the winter season) or dirt;
- Its corrosion over time such as to compromise the ATEX classified area ;
- Its breakage due to winds or weather phenomena; the supporting structure must be solid and not burden through the connections on the PRV themselves;
- Maintenance difficulties on PRVs (the threaded connections to the valves must be easily removable).

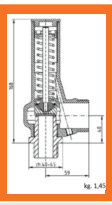
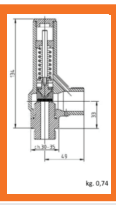
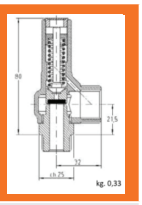
Periodic check of the relief valves: see *10. Maintenance.*

It is recommended to install an indicating device to show if part of the refrigerant has leaked from the PRV. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are evident. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid further leaks, replace the PRV.

The following table shows the technical and outflow characteristics of each safety valve mounted on the chillers.

This table also shows an example sizing for the conveying pipe (EN 13136) and for the determination of the area classified according to EN 60079-10-1 for each PRV.

Reference A2L refrigerant R1234ze

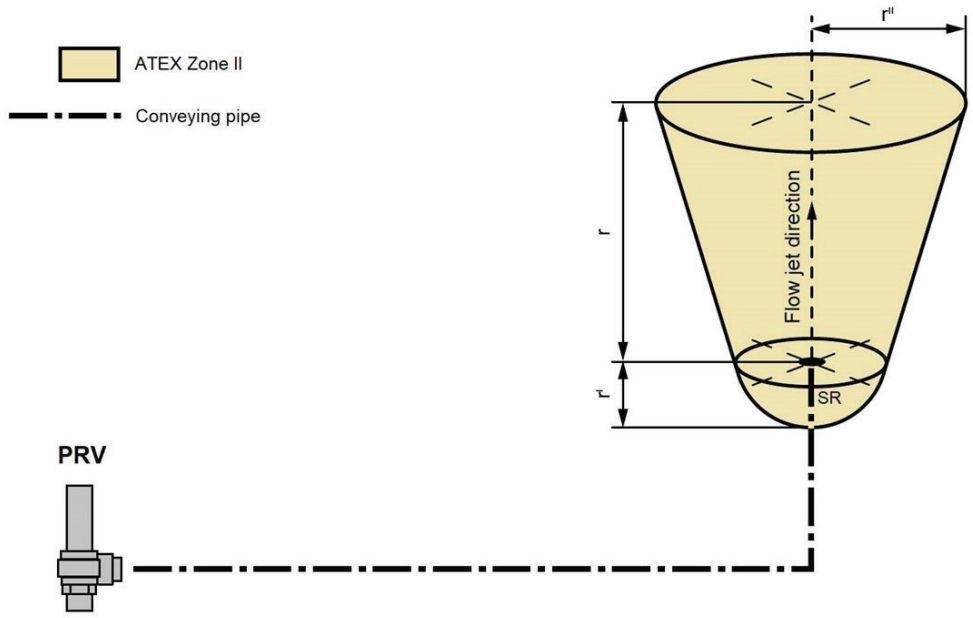
PRV Model	G20 S 	G14 S 	D10 CS 
Circuit side x q.ty for each circuit	HP 1-3	LP 1	LP 1
Outlet connections	G. 1 1/4" ISO228	G. 1" ISO228	G. 3/4" ISO228
Flow diameter [mm]	20	13.5	10
Flow section [mm^2]	314	143	79
Low flow discharge coefficient Kdr	0,83	0,86	0,86
Set pressure [barg]	22	14	14
Discharge approx. capacity [Kg/h]	11900	3450	1900
Discharge recommended pipe for 5 mt equivalent length	2 1/2"	2"	1 1/2"
Conic jet dangerous distance r [m]	7	5	4
Conic jet dangerous distance r' [m]	2,1	1,5	1,2
Conic jet dangerous distance r'' [m]	6,14	4,4	3,52

NOTICE

Suitable gloves and goggles must be used when handling pressurized fluids especially during maintenance work on the safety valves.

The following graph shows the zone classified according to ATEX (zone II) that is generated at the end of the conveying pipe of each safety valve; it is a conical ATEX zone which must be properly managed inside the installation site and in particular must not contain ignition sources (see EN1127-1) or devices not suitable for operation in explosive atmospheres.

If several valves are conveyed together, the user must recalculate this ATEX classified zone according to EN60079-10-1, considering a discharge flow rate equal to the sum of the PRVs that are connected to the manifold (contact Vertiv™ for how to consider the simultaneity coefficient of the PRVs under the same manifold).



If multiple conical zones corresponding to multiple valves physically overlap, their categorization according to ATEX does not change (ZONE 2 remains).

NOTICE

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

Never cover any protection devices.

This applies to the relief valves, in the refrigerant or heat transfer medium circuits, and the pressure switches.

Ensure that the valves are correctly installed, before operating the unit.

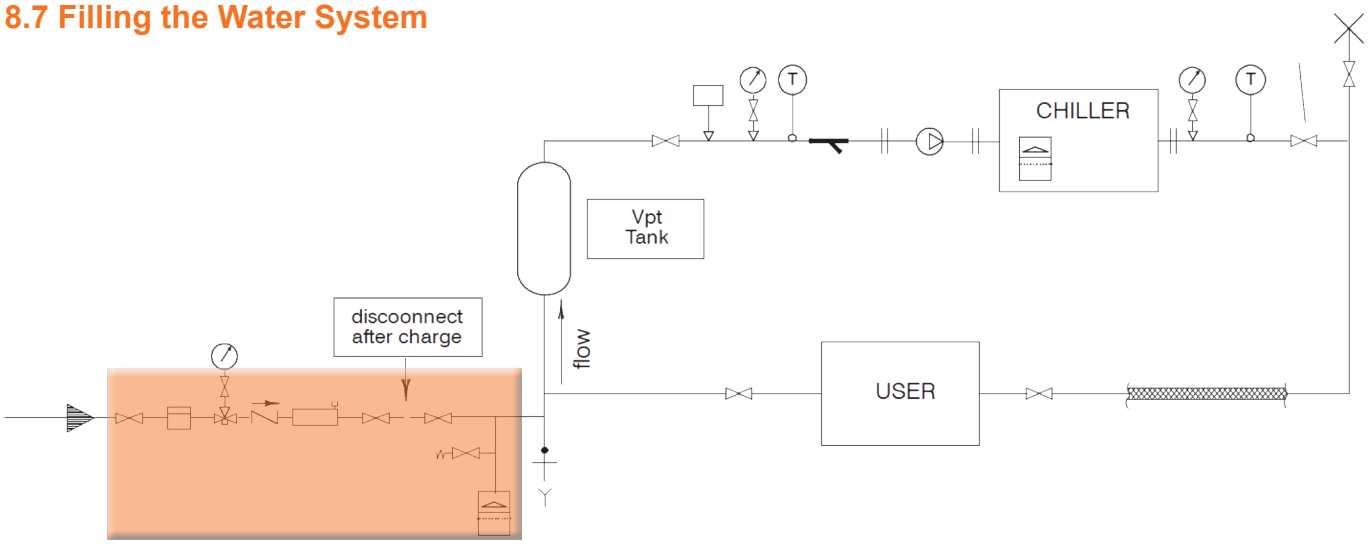
If the relief valves are installed on a change-over manifold, this is equipped with a relief valve on each of the two outlets. Only one of the two relief valves is in operation, the other one is isolated. Never leave the change-over valve in the intermediate position, i.e. with both ways open (locate the control element in the stop position). If a relief valve is removed for checking or replacement please ensure that there is always an active relief valve on each of the change-over valves installed in the unit.

The relief valve must only be removed and fully controlled and after checking that this is allowed by local regulations and authorities. This is the responsibility of the operator.

If the exchange tap is not installed, it is possible to have a ball valve installed upstream of the safety valve; to close this ball valve and proceed with maintenance operations, it is essential to break a sealed seal which must be restored when the valve opens once these operations are completed. These operations can only be done by authorized and qualified personnel according to EN 378. This is the responsibility of the operator.

Please check that this is allowed by local regulations and authorities.

8.7 Filling the Water System



- Supply water through the fill group.

See *8.4 Water System Specification* for the amount of water to charge.

- In case of low ambient temperature, add glycol: see *8.4.8 Prevent freezing for chiller or freecooling chiller.*
- To avoid stratification, run the circulation pump for at least **30** minutes after adding any glycol.
- At the end of the filling operation, disconnect the water supply tube.
- After any topping-up of water check the concentration of the glycol if necessary.

NOTICE
Always charge the hydraulic circuit with the required glycol percentage necessary for the minimum ambient temperature of the installation site. Failing to comply with this instruction shall invalidate the unit warranty.

NOTICE
In units having A2L gas during the first hydraulic loading of the system (or in the case of maintenance - restoration of hydraulic circuit filling following refrigerant leaks from the refrigerant circuit) it is mandatory to analyze with a gas detector (having a sensitivity of **3** gr. / year) the air leaving the vents positioned on the highest parts of the FC exchangers and the circuit, detecting the absence of any trace of refrigerant.

NOTICE
Do not exceed the nominal operating pressure of the circuit's component.

8.8 Initial Checks

NOTE: *Follow these instructions at first start-up and also in case of restart after a long stop.*
NOTE: *Record the functional data on the Start-Up certificate.*

Electrical system

WARNING
Disconnect the power supply before doing the following checks on the electric system as explained in *8.2 Safety Instructions*.

WARNING
When installing units with **A2L** refrigerant, **before connecting the power supply through the EP main switch**, open the compressor box approaching it in total absence of possible ignition sources (ref. EN1127-1) and check the internal box atmosphere with a portable ATEX leak detector.

WARNING
After the commissioning, units with **A2L** refrigerant (even when not operating) must have the **nominal power supply continuously granted in order to keep the safety equipment functionality**. Each time the unit is physically powered-off for a continuous period for any reasons, the manual check with portable leak detector must be repeated to grant safe operation and avoid incident risks.

- Check all the cable connections particularly the main power connections on the power fuses and contactors.
- Check that all thermal protections are calibrated according the electrical data tables reported on wiring diagram.

Refrigerating system

- Open the discharge valve (and the suction valve, if installed) of the compressor and the shut-off valve on the liquid line.
- Open the valves of the refrigerating circuit that had been closed before the initial check.

Water system	• Check all water connections. • Open all isolating valves and/or water ball valve. • In case of climates with temperatures below zero degrees C, make sure the chilled water circuit is filled with the correct concentration of water/glycol, see *8.4.8 Prevent freezing for chiller or freecooling chiller*. • Bleed all air out of the chilled water circuit. • Verify the water flow rate and its direction. • Ensure that the thermal load is sufficient and stable for start-up. • Start the pumps, check that they rotate in the correct direction.
Covers and seals	• Make sure that all the protective covers and seals have been mounted again.
Replace the cartridge of the driers	At first start-up is recommended to replace the cartridge of the driers, see *10.7.5 Cartridge of the driers*.
Everything OK?	Power-up and prepare for normal operation: see *9. Operation*

9. Operation

9.1 Safety Instructions

Personnel

WARNING

The operation has to be done by a qualified technician with an experience and know-how on units, Vertiv™ iCOM3™ control board and software.
The authorized personnel must be properly trained and qualified, wear appropriate personal protective equipment and use adequate tools.

Electric System

NOTICE

The power supply should never be disconnected during normal operation, except when performing maintenance (see *10. Maintenance*).

Personal Protective Equipment

Environment

ENVIRONMENT

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage.
See *10.8 Calibrations* and make reference to the *Vertiv™ iCOM3™ User Manual* for correct parameter settings.

9.2 Power-up

1. Close the disconnection device upstream the **Liebert® AFC**.
2. Close the main switch [**A**]
3. Set the general knife switch [**B**] to the position "**I**".

- Check that the Vertiv™ iCOM3™ display [**C**] switches **ON**.
- In case of first start-up or after maintenance on the electric system, check again by a voltmeter or tester if the voltage and phase difference fall within the indicated limits.

WARNING

When installing units with **A2L** refrigerant, **before connecting the power supply through the EP main switch**, open the compressor box approaching it in total absence of possible ignition sources (ref. EN1127-1) and check the internal box atmosphere with a portable ATEX leak detector.

WARNING

After the commissioning, units with **A2L** refrigerant (even when not operating) must have the **nominal power supply continuously granted in order to keep the safety equipment functionality**. Each time the unit is physically powered-off for a continuous period for any reasons, the manual check with portable leak detector must be repeated to grant safe operation and avoid incident risks.

9.3 Preparation

NOTE: *Follow these instructions at first start-up and also in case of restart after a long stop.*

Compressor pre-heating and check

When you set the general knife switch [**B**] to the position "**I**", the compressor oil heaters are automatically powered **ON**.

NOTICE

The pre-heating of the compressor oil takes about **8** hours.

- Remember to power up the unit well in advance before starting the normal operation.

- Make sure the auxiliary circuit has been powered and check the operation (a fault due to an incorrect procedure will invalidate the compressor guarantee).

At the end of the pre-heating:

- check that all the valves the refrigerating circuit are open
- check that the compressor intake pressure is higher than 6.5 bar for R134a-R513A or higher than 4.5 bar for R1234ze

If this is not the case, prolong the pre-heating of the compressor and check that the refrigerant EEV valve is properly closed.

For A2L refrigerants: Gas detector stabilizing after power ON or restart

After applying power, the instrument will enter a warm-up period to allow the sensor element to stabilize before reporting a valid output; it's possible that this time period could last about **20** min.

NOTE: *When you set the general knife switch [**B**] to the position "**I**", the gas detector instrument is automatically powered **ON**.*

MANDATORY: newer enable starting the normal operation first start or restart (compressors start automatically) before **20** min.

MANDATORY: in case the unit is without Power for a time more than **5** min, it's mandatory to **STOP** the normal operation mode (switching **OFF** the unit control) and waiting **20** min. or more (till the oil temperature is **OK**) when the Power coming back to **ON**.

NOTE: *This procedure is not necessary to apply for unit with fast start procedure because the gas detector instrument is still powered by a dedicated UPS safety line and because the power **OFF** time period is very short (usually less than **5** min.); both conditions has to be checked and provided by customer for safety reasons.*

Water system

- Check the evaporator water system, which is the thermal load connected with the **Liebert® AFC**.
- Start the evaporator pumps.

To avoid an increase in the water temperature inside the evaporator, with the risk of deposit formation:

- when you are going to start the **Liebert® AFC** unit, start the pumps in advance.
- when you stop the **Liebert® AFC** system, let the pumps run for a while.

9.4 Start

NOTICE

Before starting the unit, make sure that the compressor has been heated for at least **8** hours.

- On the Vertiv™ iCOM3™ control panel [**A**] set the switch to **ON**.

9.5 Check the Operation

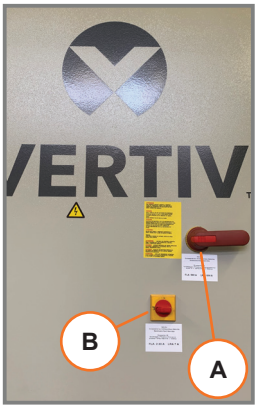
NOTICE

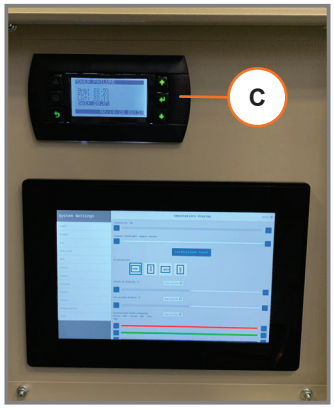
The following checks must be done:

- at first start-up;
- in case of restart after a long stop;
- at time intervals during the normal operation.

Protection Flow-switch	Check the flow switch operation (installed by the customer) • close the shut-off valve downstream the evaporator till the flow switch intervenes; • check if, without flow, the **Liebert® AFC** locks and the alarm message is displayed; • open again the shut-off valve downstream the evaporator.
Alarms	• Make sure that all the alarms due to protective devices interventions have been reset (see *Vertiv™ iCOM3™ User Manual*).
Water temperature	• Check the outlet temperature of the chilled water. • Check if the set-point set on the control is reached. **NOTE:** *During the unit start-up a temperature of the water/ glycol inlet higher than 26°C is allowed.* • Under standard operating conditions check that the limits indicated in *6.3 Operating Limits* are not exceeded.
Control and safety devices	• Check the correct operation of the control and safety devices.
Compressor	• Check the compressor oil level. See *10.7.3 Oil charge* if you need to top-up the oil. • With the compressor at full load, check there are no bubbles visible in the flow indicator. If there are any, charge the unit according to *10.7.2 Refrigerant charge*.

9.6 Stop





- On the Vertiv™ iCOM3™ control panel [**C**] set the switch to **OFF**.

In case of a short stop:

- Maintain the general knife switch [**A**] to the position "**I**" to maintain the supply to the crankcase heater.

In case of a long stop (seasonal shutdown):

1. Set the general knife switch [**A**] to the position "**0**".

This will disconnect the compressor crankcase heaters.

2. Close the main switch [**B**] to the position "**0**".
3. Close the disconnection device upstream the **Liebert® AFC**.

9.7 Restart

After a short stop	• On the Vertiv™ iCOM3™ control panel [**C**] set the switch to **ON** (as in *9.4 Start*).
After a long stop	Do the complete procedure as described in: *9.2 Power-up*, *9.3 Preparation*, *9.4 Start*
In case of Power failure	If the Power failure is shorter than a certain time, the **Liebert® AFC** restarts automatically. The time limits (to be managed by customer) are: • up to **4** hours without Fast Start Ramp Option; • up to **1** hour with Fast Start Ramp Option.
In case of Power failure for units with A2L refrigerant	If the Power failure is shorter than a certain time, the **Liebert® AFC** restarts automatically. The time limits (to be mandatory managed by customer) are: • up to **5** minutes with or without Fast Start Ramp Option; If the power failure is longer the **Liebert® AFC** needs a manual restart: • on the Vertiv™ iCOM3™, clear the alarm message due to the power fault • repeat the procedure of the previous point After a long stop.

9.8 Freecooling

Freecooling is a pre-cooling and/or cooling system of the water/glycol mixture that uses ambient air when the latter has a temperature lower than that of the return mixture. If the external temperature is low enough to dissipate the entire thermal load, the refrigeration compressors automatically turn off and the mixture temperature is controlled by the fan speed regulation. If the mixture temperature is too high, the compressors will run as long as necessary.

In the freecooling hydraulic circuit, two motorized two-way valves are installed which work in opposition: when one is open, the other is closed.

The rotation time of the actuator (90° angular rotation) is **150** seconds.

They manage the insertion of the free cooling system as well as its capacity adjustment, together with the management of the fans, if the compressors are **OFF**.

In the units configured with Glycol Free Freecooling, the activation of the freecooling system is managed by the inverter pump while its speed adjustment (up to the minimum limit determined by the inverter), together with the fan management, allows adjustment of the chiller capacity when the compressors are **OFF**.

9.9 Microprocessor Control

See the *Vertiv™ iCOM3™ User Manual.*

10. Maintenance

NOTICE

Check the unit regularly and solve the problems as they occur.

Lack of maintenance could reduce the performance or damage the unit.

10.1 Safety Instructions

Personnel

WARNING

Only authorized personnel is allowed to do maintenance operations.

All work on pipes or components of the refrigerating circuit under pressure must be exclusively made by qualified staff, competent in such works.

The authorized personnel must be properly trained and qualified, wear appropriate personal protective equipment and use adequate tools.

Electric System

WARNING

Unit contains potentially lethal voltage in some circuits.

Risk of arc flash and electric shock.
Can cause injury or death.

- Open all local and remote unit electric power disconnect switches, verify with a voltmeter that power is **OFF** and wear protective equipment per local standard before working within the electric control enclosure.
- It is forbidden to operate on the electrical components without using insulating platforms, or in the presence of water and humidity.

WARNING

The electric connection enclosures and some components can retain a stored high-voltage electrical charge for up to **10** minutes.

Risk of electric shock.
Can cause serious injury or death.

Before working within the unit electric connection enclosures proceed as follows:

- open all local and remote unit electric power disconnect switches;
- wait **10** minutes;
- verify with a voltmeter that power is **OFF.**

Only properly trained and qualified personnel may perform repair, maintenance and cleaning.

Lockout-Tagout (LOTO)

WARNING

Before any intervention on the electrical system or accessing the inner components:

- Lock the disconnection devices by a padlock or similar tool.
- Apply on the general knife switch a suitable warning plate for no operation.

High temperature

CAUTION

The front part of the compressor and the delivery pipe and the condenser are very hot.

- Be careful when operating nearby.
- Always wear temperature resistant gloves when operating on the unit.

Safeguards

CAUTION

After the maintenance interventions, always close the unit by refitting the relevant panels, if present, fastened by the fixing screws.

PPE

CAUTION

Sharp edges, splinters and exposed fasteners.

Wear protective gloves before operating on the unit.

10.2 Safety Labels

- Check regularly that the safety label is still on the unit and clearly visible. See *Annex III – Safety Labels* for safety label mapping. Replace any missing or damaged label.

10.3 Spare parts

The use of original spare parts is recommended.

When placing an order refer to "Component List" enclosed with the machine and quote the unit model and serial number.

NOTICE

If one or more compressors must be replaced, you must contact Vertiv™ Service.

10.4 Maintenance Programme

The Maintenance Programme below must be carried out by a qualified technician, preferably working under a maintenance contract.

Fans	• Check that the fan motor rotates freely and without abnormal noises, make sure that the bearings do not heat up excessively; • Check the current absorption; • Each time the electrical box of the fans and the cable glands connected to it is opened, make sure that it is properly closed, that all the seals have been checked and that the cable glands have been tightened correctly to avoid altering the original IP protection rating of the same.
Condenser and Air Filters	• Check the condition of the filters protecting the air exchangers; clean them if necessary; • Check the condition of the electrical panel ventilation filters or electrical accessory compartments, if necessary replace them; • Check the condensing coils - freecooling and clean them if necessary (see battery cleaning procedures).
Control	• Check that the control equipment, LEDs and display are operating correctly; • Check the supply voltage; • Check the operation of the compressor's oil heaters; • Check the correct operation of the compressors' partialization solenoid valves; • Check the conditions of the power contacts of the contactors (compressors, pumps, etc.); • Check the conditions of the remote control switch contacts; • Check the operation of the evaporator hydraulic circuit resistance on glycol free units; • Check the operation of the electrical panel fan and the heating elements (if present).
Electrical circuit	• Check the electrical supply on all phases; • Ensure that all electrical connection are tight; • Check the correct calibration of the safety and control devices (see *10.8 Calibrations*), as well as their proper intervention.
Refrigeration circuit	• Check the condensing and the evaporating pressure (to be done by a refrigeration technician); • Check the compressor current absorption, the delivery temperature and possible unusual noises; • Check the refrigerant charge by mean of the sight glass; • Check that the safety device operates correctly; • Check the correct operation of the EEV valve (superheat between 5°-8°C, see *10.8.2 Electronic expansion valve*); • Check that the oil level indicated by the compressor sight glass is higher than the min. value; • Check the sealing of the ON-OFF component (solenoid valves, shut-off valves, etc.).
Adiabatic system	• Check the manual *Adiabatic System for Liebert® AFC (code 10049109)* for the maintenance aspects.
Water circuit	• Ensure that there are no water leaks; • Bleed any air out of the hydraulic circuit using the bleed valve; • Verify the correct water flow inlet; • Check the inlet-outlet water temperature and pressure; • Check the correct operation of the two-way valves; • Check if the system is charged with the specified glycol percentage and that no ice has formed in the hydraulic circuit;

Water circuit	• Check the evaporator cleanliness; • Check the electric pump current; • Check the noise of the electric pump; • Check the periodic lubrication of the electric pump.
PRV	• Replace PRV on refrigerant circuit every **2-3** years according local norms – regulations.
Phase correction capacitors	• Check every year the Cr [µF] is as indicated on component label (accepted -5% / +10%); • Check every year the state of aluminum can and overpressure disconnector; • In case of installation with hot climate, over tension, transient over voltage or low power quality (harmonics) it's necessary to replace capacitors every **2** years according working conditions; • In case of normal working conditions, it's necessary to replace capacitors every **4** years.
Refrigerant leak detector (R1234ze)	• Semiconductor gas sensor element: check calibration **6** months after commissioning and every **12** months thereafter; • Replace gas sensor element every **2** years.
Compressor box ventilation fans	• Check fans functionality every **12** months; • Replace ATEX fans every **4** years.

10.4.1 Functional and maintenance remarks for AFC with A2L

WARNING

When installing units with **A2L** refrigerant, **before connecting the power supply through the EP main switch**, open the compressor box approaching it in total absence of possible ignition sources (ref. EN1127-1) and check the internal box atmosphere with a portable ATEX leak detector.

WARNING

After the commissioning, units with **A2L** refrigerant (even when not operating) must have the **nominal power supply continuously granted in order to keep the safety equipment functionality**. Each time the unit is physically powered-off for a continuous period for any reasons, the manual check with portable leak detector must be repeated to grant safe operation and avoid incident risks.

Check any possible leakage on joints, flange, connections, sealings of refrigerant circuit according.
Necessary to have a leakage detector with sensitivity <3 gr/year.
All servicing devices used for checking and repairing the refrigerant circuits has to be ATEX compliant .
During checking or repairing activity in case of leakage, ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.
Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so according EN378.
All welding operations must be carried out by qualified specialists.
Before opening a refrigerant circuit, purge and consult the pressure gauges. Reclaim the refrigerant using a proper refrigerant reclaim device and reclaim cylinders.
The refrigerant circuit should be pumped down and then purged with nitrogen before servicing.
During a brazing operation, the refrigerant circuit should be purged with nitrogen. Also when servicing the refrigerant circuit, all ignition sources should be disabled.
Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer, observing applicable standards (e.g. during draining operations). The unit must be switched **OFF** during maintenance.

NOTE: *The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device and lead to the risk of a pressure increase. This valve is situated on the liquid line before the filter drier box.*

During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.

- Periodic inspections of the safety devices and external overpressure devices (external relief valves) must be carried out in accordance with national regulations;
- Periodic inspections for refrigerant leaks may be required depending on European or local legislation.

Please contact Vertiv™ for more information.
Repair the leak, detect and recharge the circuit with the total R1234ze(E) charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. Only charge liquid refrigerant R1234ze(E) at the liquid line. Always ensure you are using the correct refrigerant type before recharging the unit. Charging any refrigerant other than the original type (R1234ze(E)) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic polyester oil as indicated on stickers attached on compressor's frame.

RISK OF EXPLOSION: Never use air or a gas containing oxygen during leak tests to purge lines or to pressurize the unit. Pressurized air mixtures or gases containing oxygen can be the cause of an explosion.
Only use dry nitrogen for leak tests, possibly with an appropriate tracer gas.

If the recommendations above are not observed, this can have serious or even fatal consequences and damage the installation.

Never exceed the specified maximum operating pressures.

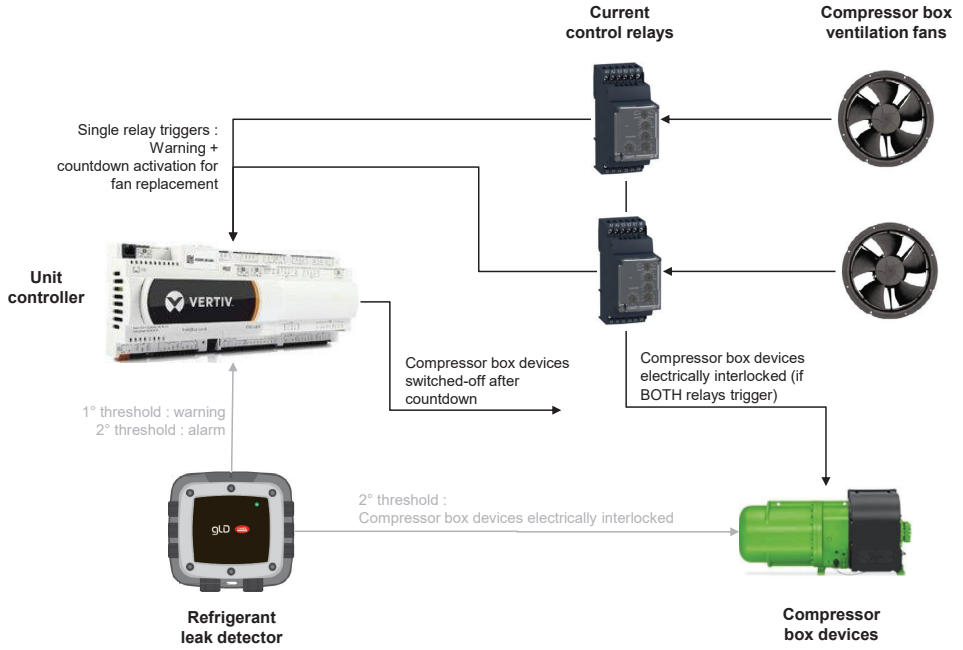
Verify the allowable maximum high and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) as well as the oil have been removed from chiller. Traces of vapour should be displaced with dry nitrogen.

The compressors box has a continuous safety mechanical ventilation system necessary to declassify the zone according ATEX EU directive.

The logic of mechanical ventilation, alarm management shall also be assured with an emergency controls (connected to unit control by modbus) located outside the compressor box (only sniffer sensor is located at the ATEX fan's inlet); a proof of airflow in case of leakage is assured by fans & sensor location and a proper safety LAB testing.

In the following flow chart the operation – safety logic is described.


Current control relays
Compressor box ventilation fans
Single relay triggers : Warning + countdown activation for fan replacement
Unit controller
VERTIV
Compressor box devices switched-off after countdown
Compressor box devices electrically interlocked (if BOTH relays trigger)
1° threshold : warning
2° threshold : alarm
2° threshold : Compressor box devices electrically interlocked
Refrigerant leak detector
Compressor box devices

Please consult leakage sensor control for respond time (normally always less than **20** min.), settings of lower and alarm threshold (150 – 500 ppm) taking care that full scale is at 1000 ppm

- The sensor should include internal self-checking diagnostics;
- The sensor should be set with lowest value from **FCL** (Flammable Concentration Limit) or 50% of **PL** (Practical Limit) as defined by EN-378;
- For R1234ze(E), the different limits are defined as follow:
  - **LFL** - Lower Flammability Limit = 65,000 ppm;
  - **FCL** - Flammable Concentration Limit equal 25% of the LFL = 16,000 ppm.
- The ventilation system, refrigerant sensor and alarm system should be routinely inspected as part of the maintenance programmed of the chiller:

During Commissioning:

- Check calibration;
- Check LEDs for proper operation;
- Check for proper buzzer and relay operation;
- Check signal transmission to the controller if connected.

Periodic Maintenance

For **SC** semiconductor element: **6** months after commissioning and every **12** months thereafter including ATEX fans ventilation check.

WARNING: Semiconductor sensitive elements should be checked after exposure to significant concentrations of gas, which can shorten the sensor lifetime and/or reduce its sensitivity.

Component replacement:

- Gas Detector Sensor has a typical sensor lifetime about **4** years, Vertiv™ request to replace it every **2** years;
- Compressor box ventilation fans has a typical sensor lifetime about **8** years, Vertiv™ request to replace it every **4** years.

10.5 Coils cleaning

Periodic cleaning can reduce the extent of corrosion and is necessary for the continuos service of MC. In the table below the guidelines for application of MC in different atmosferic corrosivity categories according to ISO 9223:2012 standard:

Tab. 63 - The guidelines for MC coil coating selection for different atmosferic corrosivity category

	Athmospheric Corrosivity ISO 922	C1 - C2	C3		C4	C5	CX
			Inland	Coastal			
	Corrosivity	Very Low - Low	Medium		High	Very High	Extreme
	Typical enviroments / examples	Indoor, Rural areas	Urban areas	Urban areas	Polluted Urban, Industrial, coastal areas	Very High pollution & salt deposition areas	Extreme Industrial, costal areas
Corrosion Resistance	digit 13 = 0	OK	OK	AP	NR	NR	NR
	digit 13 = 1	OK	OK	OK	OK	AP	NR
	digit 13 = 2	OK	OK	OK	OK	AP	NR

OK: Recommended;
AP: Acceptable when protection is applied, life mat be shortened. Protection could be a additional separating wall or filter screen;
NR: Not recommended;

According to the atmosferic corrosivity, the frequency of cleaning is suggested to be not less than the one indicated in the table.

Particular adverse conditions of the installation site (dust, sand, etc.) may require significant higher frequency of cleaning.

Tab. 65 - Frequency indication for Cleaning Procedures based on different areas

	Athmospheric Corrosivity ISO 922	C1 - C2	C3		C4	C5	CX
			Inland	Coastal			
	Corrosivity	Very Low - Low	Medium		High	Very High	Extreme
	Typical enviroments / examples	Indoor, Rural areas	Urban areas	Urban areas	Polluted Urban, Industrial, coastal areas	Very High pollution & salt deposition areas	Extreme Industrial, costal areas
Cleaning Frequency	Visual Inspection	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
	Water Rinse Cleaning	Annually	Once a quarter	Once a quarter	Monthly	Monthly	Monthly
	Cleaner Cleaning	Biannually	Biannually	Biannually	Biannually	Biannually	Biannually

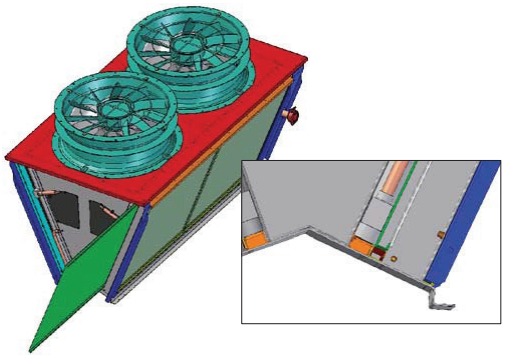
Obstructions due to dust, pollution, etc. accumulated between the fins of the coil, they can be removed by washing under pressure.

This should be done periodically.

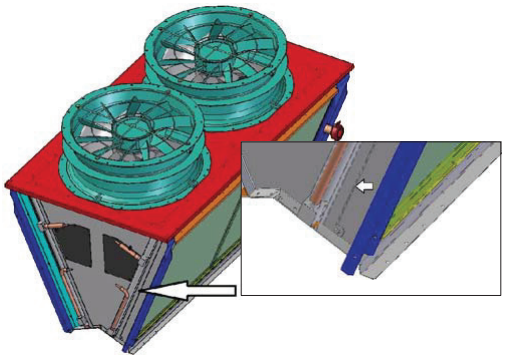
Before operating:

1. Disconnect the unit from the power supply;
2. Wait for the fans to stop completely;
3. Make sure that the fan blades cannot move for any reason (for example: wind). Lock them mechanically to avoid accidental contact with the rotating blades.

1. If present, remove the adiabatic system as described in the manual *Adiabatic System for Liebert® AFC (code10049109)*
2. If present, remove the air filters and the "**V**" shaped panels.
3. Remove the narrow and long panel between the microchannel battery and freecooling.



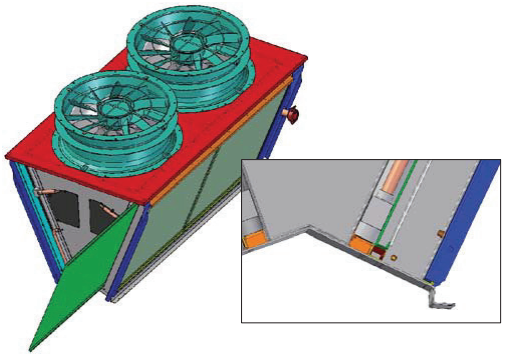
4. Insert the bulkhead between the microchannel and the free cooling so that the lower channel is facing the free cooling battery.



5. Wash the freecooiling battery with a lance at a distance of about **20** cm from the battery surface

CAUTION
Higher pressures and / or the use of the lance with a distance of less than **20** cm from the battery surface could damage the fins of the freecooling battery.

6. Dry the battery with an air compressor.
7. Remove and rotate the battery in such a way that the lower channel is facing the microchannel condenser.



8. Wash the microchannel battery with a lance at a distance of about **5** cm. In order to use the windows on the "**V**" shaped partition, it is necessary to have a nozzle with right angle flow. If you do not have this type of lance, you must remove the fans and introduce the lance into the internal space of the unit.

   For a better result, washing must take place in such a way that the water jet is as perpendicular as possible to the surface. For this purpose the fans could be removed

CAUTION
Higher pressures and / or the use of the lance with a distance of less than **5** cm from the battery surface could damage the fins of the microchannel battery.

Do not use chemicals to wash the microchannel condenser.
This can lead to corrosion!

1. Dry the microchannel with an air compressor.

CAUTION
Climbing on the roof of the machine is prohibited without personal protection devices as required by the safety regulations in force in the place of installation. This also applies to maintenance of the fans for reasons other than cleaning the exchangers.

2. Remove the sheet metal.
3. If removed, reinstall the fans.

10.6 Lubrication of pumps

The bearings of motors with power up to 11 kW are greased for life and therefore do not require lubrication.

The bearings of motors with power equal to or greater than 11 kW must be lubricated in accordance with the indications on the motor nameplate, in particular observing the required intervals.

The engine must be lubricated with lithium-based grease that meets the following specifications:

- NLGI grade 2 or 3.
- Base oil viscosity: 70 to 150 cSt at 40°C (approximately +104°F).
- Temperature range: -30°C (-22°F approximately) to 140°C (+284°F approximately) in continuous operation.

10.7 Refrigeration System

10.7.1 Inspection

- Check that the refrigeration pipes are firmly fixed. The refrigeration pipes shall not shake with the vibration of wall, earth or equipment frame. Otherwise reinforce the refrigeration pipes with fasteners.
- Check that there is no oil on the accessories of all refrigeration pipes, and make sure that the pipes do not leak.

10.7.2 Refrigerant charge

Before shipment each unit is charged with the right amount of refrigerant and oil.

You may need to do again the refrigerant charge in case of interventions on the refrigerating circuit.

NOTICE

Never use the compressor for the system vacuum with A1 refrigerant (this invalidates the warranty).

NOTICE

Never use the compressor for the system vacuum with A2L refrigerant: possible entry of air in the refrigerant circuit could create the hazard risk of explosion.

NOTICE

It is important to carry out charging correctly.

An excess of refrigerant causes an increase in sub-cooling and consequent operating difficulties in the hot season.

A shortage of charge generates an increase in superheating and possible compressor stoppages.

Whenever work is carried out on the unit, ensure afterwards that the working conditions are correct, checking subcooling and superheating.

NOTICE

Never use the compressor for the system vacuum with A2L refrigerant: possible entry of air in the refrigerant circuit could create the hazard risk of explosion.

NOTICE

In case of extraordinary maintenance on inverter units, to vacuum the refrigerant circuit without applying main voltage, it is first necessary to activate **"Evacuation mode"** of the CSV to keep the compressor internal valves open. Then, before re-charging the system it is important to power-up the frequency inverter and deactivate the **"Evacuation mode"** so that the valves close.

ENVIRONMENT

While repairing the refrigerating circuit recover all the refrigerant in a container: do not allow it to escape.

Before starting the refrigerant charge	• Ensure there are no water leaks. • Check the refrigerant charge in the refrigerating circuit: a unit originally charged by the manufacturer with a certain refrigerant cannot be charged with other refrigerant. • Apply to the Technical Support Department if you need more information.
Do the charge	• Charge with the compressor in operation, by connecting the gas cylinder with the charge connector after the thermostatic expansion valve. • Drain the connection pipe between the cylinder and the charging point; tighten the seal joint and then start charging the unit. • It is imperative that the cylinder is weighed both before and after the operation. • Charge the unit until the bubbles in the sight glass have disappeared and the working conditions of the entire refrigeration circuit have returned to normal (sub-cooling and superheating within the limits indicated below).

Measure the superheat	• Detect the temperature on the suction line, close to the bulb of the thermostatic expansion valve, using a contact thermometer. • Connect a pressure gauge (by max a 30 cm pipe) with the Schraeder connection and read the corresponding saturated evaporating temperature. • The superheat is the difference between the two readings. • Verify that the superheat is 4°-8°C.
Measure the sub-cooling	• Detect the temperature on the liquid line using a contact thermometer. • Connect a pressure gauge (by max a 30 cm pipe) with the Schraeder connection on the liquid line and read the corresponding saturated condensing temperature. • The sub-cooling is the difference between the two readings. • Verify that at the condenser outlet, sub-cooling is 4°-8°C.
Check the oil level	Let the compressors run for a short time, then check the oil level for each compressor.
Check the operating conditions	With the pressure gauges connected, check - the working pressures and that: - the evaporation temperature is lower than the water temperature exiting the evaporator, For a correct system testing, also check the compressor discharge temperature: - with the indicated over-heating and sub-cooling data, it must be about 15-20°C higher than the condensing temperature for R134a, 10°-15°C higher for R513A, 8°-12°C higher for R1234ze - it must never exceed 95°-100°C

10.7.3 Oil charge

Before shipment each unit is charged with the right amount of refrigerant and oil.
If there has been any loss of oil then this must be topped up as follows.

NOTICE
PAY ATTENTION on the type of synthetic polyester oil as indicated on stickers attached on compressor's frame; on R1234ze units there are two different type of oil between each circuit (BSE170 for fixed screw, BSE170 L on inverter screw).

NOTICE
The oil changes according to the type of used refrigerant and the type of compressor; please refer to stickers attached on compressor's frame for the correct synthetic polyester oil type.
Contact the Technical Support Department for the specifications of the oil to be used for topping up.
Top-ups of up to 20-30% of the total amount of oil contained in the compressor crankcase are permitted; for larger percentages contact the technical support department.

NOTICE
Never mix different oils together.
Clean the piping completely before changing the type of oil used.

Prepare the oil	• Take a clean, dry, transparent container (with volume calibrations) and fill it with at least twice the amount of oil required.
Prepare the compressor	• Isolate the compressor by closing the delivery and suction shut-off valves (or the one on the liquid line). • Connect to the fittings on the compressor body (Schraeder valves) and empty it of refrigerant until atmospheric pressure (1 bara) is reached.
Refill with oil	• Using a pipe, connect the oil container to the oil service shut-off valve on the lower central part of the compressor. • Open the oil service shut-off valve lifting the container, so that the oil flows by gravity. • Charge the required quantity of oil (make sure the tube always remains below the oil level).

Restore the compressor operation	• Close the oil service shut-off valve. • Open the shut-off valves of the compressor and on the refrigerating circuit. • Restore the drained refrigerant charge (see *10.7.2 Refrigerant charge*).

10.7.4 Compressor maintenance schedule - checks and tests

Compressor reverse direction	To protect against reverse rotation when stopped, a check valve is incorporated under the compressor's delivery valve. If the compressor runs in reverse direction for more than **5** sec. after switch-off, the valve may be damaged and should be replaced.
Periodic check	Check the correct functioning every **5.000** compressor working hours.
Bearings	Screw compressors are equipped with fatigue resistant bearings, therefore replacement is not necessary provided that the refrigerant circuits are operated under standard conditions within the operating limits and respecting the indicated maintenance schedule. Bearing wear detection is to be carried out by sound analysis. The recommended inspection interval is every **10.000** compressor working hours. For preventive maintenance, the recommended interval for replacing the bearings is every **40.000** working hours of the compressors. Anyway, under the standard operating conditions of the **Liebert® AFC** units (resulting from the air-conditioning application where the condensation is mainly lower than 50°C in **one** operating year) the life limits of the bearings are not reached. Due to occasional variations of the compressor standard operating conditions, such as: lack of oil, moisture in the refrigerant, insufficient superheating or thermal overload, the bearings may need to be replaced. Please contact our Service department if it's necessary to replace the compressor's bearings: • Only authorized service centers are authorized to open the screw compressor.
Motor	It is important to check the motor wear by measuring the resistance of the insulation of its windings. The recommended inspection interval is every **10.000** compressor working hours.

10.7.5 Cartridge of the driers

Replace the cartridges

Liebert® AFC is equipped with a shut-off valve on the liquid line upstream of the refrigerant filter (see *Annex II - Refrigerating Circuit*).

- **Close the shut-off valve**.
- Replace the cartridges.
- **Open the shut-off valve!**

ENVIRONMENT
The used cartridges are hazardous waste and must be disposed according with the local norms in force.

10.8 Calibrations

ENVIRONMENT

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage.

10.8.1 Safety devices

The **Liebert® AFC** has been already tested and calibrated by the manufacturer.

The following setting values are used for R134a/R513A/R1234ze:

Component	Settings for R134a-R513A models	Settings for R1234ze models
Safety valves	High Pressure Side (HP): 22 barg Low Pressure Side (LP): 14 barg	High Pressure Side (HP): 22 barg Low Pressure Side (LP): 14 barg
High pressure switches	STOP: 20 barg (18 barg for *H4/3 195 models) START: 16 barg (14 barg for *H4/3 195 models) DIFF.: 4 barg (fixed)	STOP: 18 barg START: 14 barg DIFF.: 4 barg (fixed)
Low Pressure switches (*)	STOP: 0,5 barg START: 0,7 barg DIFF.: 0,2 barg	STOP: 0,0 barg START: 0,2 barg DIFF.: 0,2 barg
Antivacuum Low Pressure switches		STOP: -0,2 barg START: 0,5 barg DIFF.: 0,7 barg

NOTE: *(*) The low pressure side is managed by electronic control Vertiv™ iCOM3™, not by electromechanical devices.*

10.8.2 Electronic expansion valve

The valve has already been factory-set and superheat should be reset only when it's not between 6°C and 9°C or it's present oil foam (visible on compressor's oil sight glass).

NOTICE

This operation must be performed by an experienced refrigeration technician.

NOTICE

Stop the relevant compressor before changing the EEV superheat setpoint.

Preparation	Before beginning this calibration be sure that the refrigerant charge is correct: do the subcooling measurement as specified in *10.7.2 Refrigerant charge*).
Setting	Compressor's suction pressure, temperature and superheat can be read on Vertiv™ iCOM3 control display as described in the suitable *Vertiv™ iCOM3™ User Manual* available on the machine. Use Vertiv™ iCOM3™ for resetting the superheat.
NOTE:	*If the superheat is too low, there is a risk of poor lubrication and consequent breakage of the compressor as a result of pressure shock.* *If the superheat is too high the output of the system is limited and the compressor overheats.*

10.8.3 Chiller serving special plant

The units are capable of cooling a water-glycol mixture to temperatures close to 0°C without the need for significant modifications.

In the case of modification, the set values of the safety and control components must also be modified.

This can be carried out in the factory (at the time of testing) or at the time of installation, only by qualified and authorized personnel.

10.9 Water System

Glycol

In winter, if the system is stopped, the water inside the exchangers can freeze damaging the system irreparably.

See *8.4.8 Prevent freezing for chiller or freecooling chiller*

NOTICE

Always charge the hydraulic circuit with the required glycol % necessary for the minimum ambient temperature of the installation site.

Failing to comply with this instruction shall invalidate the unit warranty.

Draining

Otherwise drain the system completely, using the suitable shut-off valves arranged in the exchangers and in the circuit, trying to drain the water residues blowing dehydrated nitrogen in the lines. Keep a small pressurization on the hydraulic circuit with nitrogen for long stock periods because the humidity on the circuit with oxygen (present in the air) could start in a corrosion process inside the exchangers piping

10.9.1 Cleaning

Exchangers cleaning may be performed only with chemical method, using commercially available products with a dual action, that is, the removal of the scale and the prevention of corrosion.
A recommended product is P3 T288 by Henkel.

11. Troubleshooting

Symptom	Possible Cause	Check or Remedy
The unit does not start	No power supply to the unit	Check voltage at input terminal block
	The circuit breaker or fuse for low-voltage transformer in unit is tripped	Locate the problem in unit electrical panel and repair
Low evaporating pressure	Low refrigerant charge	Check refrigerant charge
	EEV problem	Check EEV configuration
	High pressure drop on the liquid line	Check shut-off valve, filter drier...
High condensing pressure	High refrigerant charge	Check refrigerant charge
	Problem with condensing control fans	Check condensing control fans
The compressor does not run or does not run properly	Flow switch not responding	Check the flow switch
	The connection is loose or disconnect	Check the connection to verify that is connected securely
	The compressor doesn't modulate capacity properly	Check the solenoid valves
	The high pressure switch has shut-off the unit	Check the high pressure switch
High vibration on the unit	The compressor is not properly fixed	Check the compressor dampers
	The discharge and suction piping are not properly fixed	Check the piping
	The unit damper (if installed) is not properly fixed	Check the unit damper
	The unit is not properly connected to the hydraulic circuit	Check the joint connection

12. Dismantling the Unit

The unit has been designed and built to ensure continuous operation.
The working life of some of the main components, such as the compressors, depends on the maintenance that they receive.
The unit must be dismantled if it is moved to another site, or at the end of its technical and operational life.

ENVIRONMENT

The unit contains substances and components hazardous for the environment (electronic components, refrigerating gases and oils).
At the end of the useful life, when the unit is dismantled, the operation must be carried out by specialized refrigerating technicians.
The unit must be delivered to suitable centers specialized for the collection and disposal of equipment containing hazardous substances.
The electronic components, the refrigeration fluid and the lubricating oil inside the circuit must be recovered according to the laws in force in the relevant country.

12.1 Safety Instructions

Personnel

WARNING

Only authorized personnel is allowed to do dismantling operations.

All work on pipes or components of the refrigerating circuit under pressure must be exclusively made by qualified staff, competent in such works.

The authorized personnel must be properly trained and qualified, wear appropriate personal protective equipment and use adequate tools.

Electric System

WARNING

Unit contains potentially lethal voltage in some circuits.

Risk of arc flash and electric shock.
Can cause injury or death.

- Open all local and remote unit electric power disconnect switches, verify with a voltmeter that power is **OFF** and wear protective equipment per local standard before working within the electric control enclosure.
- It is forbidden to operate on the electrical components without using insulating platforms, or in the presence of water and humidity.

WARNING

The electric connection enclosures and some components can retain a stored high-voltage electrical charge for up to **10** minutes.

Risk of electric shock.
Can cause serious injury or death.

Before working within the unit electric connection enclosures proceed as follows:

- open all local and remote unit electric power disconnect switches
- wait **10** minutes
- verify with a voltmeter that power is **OFF**

Only properly trained and qualified personnel may perform repair, maintenance and cleaning.

Lockout-Tagout (LOTO)

WARNING

Before any intervention on the electrical system or accessing the inner components:

- Lock the disconnection devices by a padlock or similar tool.
- Apply on the general knife switch a suitable warning plate for no operation.

PPE

CAUTION

Sharp edges, splinters and exposed fasteners.
Wear protective gloves before operating on the unit.

12.2 Operations

Operation	Notes
1. Disconnect the main switch from the electric power supply	Reverse the procedure from chapter *8. Installation*: *8.6.2 Electrical power supply*
2. Discharge the water	Reverse the procedure from chapter *8. Installation*: *8.6.1 Water system piping*
3. Remove the refrigerant	**NOTICE** Handle the refrigerant according to regulations about F-Gases and safety data sheet. See *13. Regulation (EU) no. 517/2014 (F-gas)*
4. Cut the piping at inlet and outlet of the unit	**WARNING** Before cutting the pipeline, make sure that the circuit is completely discharged.
5. Remove the fixing bolts	Reverse the procedure from chapter *8. Installation*: *8.3.2 Foundations and positioning*
6. Move away the unit	See *7. Handling*
7. If you need to keep the unit in a storehouse for reuse	See *7.3 Storage*
8. If you need to scrap the unit	Handle to authorized disposal company according to the local regulations about waste disposal.

13. Regulation (EU) no. 517/2014 (F-gas)

13.1 Introduction

Stationary air conditioners and liquid chillers placed into the European Community market and operating with fluorinated greenhouse gases must comply with the F-Gas Regulation (EU) No. 517/2014.
The fluorinated greenhouse gases are listed in the Annex I of the Regulation (F-Gas, e.g. R407C, R134a, R410A, R417A, R32).
The hydro-fluoro-olefins (HFO) R1234yf, R1234ze, and all the gases listed in the Annex II of the F-Gas Regulation, are subject to reporting if imported, exported or destroyed. The other F-gas rules do not apply to these gases.
The refrigerants as R22, i.e. substances depleting the ozone layer, are not F-gas, they are banned, and the relevant regulation is Reg. (EU) no. 1005/2009 and the following amendments.

13.2 Normative References

F-gas	**517/2014**	Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006
Certified personnel and Companies	**2015/2067**	Commission Implementing Regulation (EU) 2015/2067 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of natural persons as regards stationary refrigeration, air conditioning and heat pump equipment, and refrigeration units of refrigerated trucks and trailers, containing fluorinated greenhouse gases and for the certification of companies as regards stationary refrigeration, air conditioning and heat pump equipment, containing fluorinated greenhouse gases
Leak check air conditioning	**1516/2007**	Commission Regulation No 1516/2007 of 19 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases
Leak check fire protection systems	**1497/2007**	Commission Regulation No 1497/2007 of 18 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary fire protection systems containing certain fluorinated greenhouse gases From 01/01/2017 to be replaced by: Commission Implementing Regulation (EU) 2015/2068 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, the format of labels for products and equipment containing fluorinated greenhouse gases

13.3 Fluorinated Greenhouse Gases

- Following notes must be considered when operating with the above-mentioned equipment:
- Fluorinated greenhouse gases are covered by the Kyoto Protocol.
- The fluorinated greenhouse gases in this equipment should not be vented to the atmosphere.
- Referring to the value noted in Annex I and Annex IV of Regulation (EU) No 517/2014, here below the global warming potential (GWP) of some major F-gases or mixtures:

R134a	GWP 1430	R407C	GWP 1774	R410A	GWP 2088
R417	GWP 2346	R32	GWP 675		

As previously told, the HFO gas as R1234ze or R1234yf are not F-Gas and the relevant GWPs, per info, are as follows:

R1234yf	GWP 4	R1234ze	GWP 7

13.4 Operators

13.4.1 Definitions

- Operator, according to Regulation 517/2014 Article 2, point 8, means the natural or legal person exercising actual power over the technical functioning of products and equipment covered by this Regulation.
- The State may, in defined, specific situations, designate the owner as being responsible for the operator's obligations.
- Where large installations are involved, service companies are contracted to carry out maintenance or servicing. In these cases the determination of the operator depends on the contractual and practical arrangements between the parties.

13.4.2 Obligations

Operators of stationary air conditioners, which contain fluorinated greenhouse gases, shall, using all measures which are technically feasible and do not entail disproportionate cost:

a Prevent leakage of these gases and as soon as possible repair any detected leakage.

b Ensure that they are checked for leakage by certified personnel.

c Ensure for putting in place arrangements for the proper recovery by certified personnel.

d According to Regulation 517/2014 the operators shall ensure that the equipment is checked for leaks as following:
Case 1 - Non-sealed equipment contains less than **5** tonnes of CO_2 equivalent of fluorinated greenhouse gases.
► Leakage test not required
Case 2 - Hermetically sealed equipment contains less than **10** tonnes of CO_2 equivalent of fluorinated greenhouse gases.
► Leakage test not required
Case 3
► **Leakage test required:** check the equipment for leaks with the minimum frequency given in the following table:

X = Tonnes of CO_2 Equivalent	Y = equivalent amount of refrigerant [kg]				Minimum frequency for leak check	
	R513A	R134a	R410A	R1234ze	with leakage detection	without leakage detection
5 ≤ X < 50	7,9 ≤ Y < 79	3,5 ≤ Y < 35	2,4 ≤ Y < 24	714 ≤ Y < 7143	12 Months	24 Months
50 ≤ X < 500	79 ≤ Y < 790	35 ≤ Y < 350	24 ≤ Y < 240	7143 ≤ Y < 71429	6 Months	12 Months
X ≥ 500	Y ≥ 790	Y ≥ 350	Y ≥ 240	Y ≥ 71429	3 Months	12 Months

e Recovery for the purpose of recycling, reclamation or destruction of the fluorinated greenhouse gases, pursuant to Art. 8 of the Regulation 517/2014 shall take place before the final disposal of that equipment and, when appropriate, during its servicing and maintenance.

13.5 Leakage Detection

The manufacturer approves the following leakage check methods according to Reg. 1516/2007 and Reg. 1497/2007:

	Method	Specifications
a	Check of circuits and components representing a risk of leakage with gas detection devices adapted to the refrigerant in the system	Gas detection devices shall be checked every **12** months to ensure their proper functioning. The sensitivity of portable gas detection devices shall be at least five grams per year.
b	Application of ultraviolet (UV) detection fluid or suitable dye in the circuit	The method shall only be undertaken by personnel certified to undertake activities which entail breaking into the refrigeration circuit containing fluorinated greenhouse gases.
c	Proprietary bubble solutions/soapsuds	---

13.6 Labelling

The label applied on the unit (see *Onboard Label*) is designed to fill-in the relevant amounts of refrigerant according to Regulation 1494/2007 (2015/2068):

a Where fluorinated greenhouse gas is foreseen to be added to the equipment outside of the manufacturing site at the point of installation, a dedicated label accommodates notation of both the quantity [kg] pre-charged in the manufacturing plant and of the quantity charged at the installation site as well as the resulting total quantity of F-gas as a combination of the above mentioned quantities, in a manner which conforms to the legibility and indelibility.

Our split units are usually not pre-charged on factory, in this case the total quantity of refrigerant charged in the unit has to be written in the relevant label, during the commissioning operation at the installation site.

All of the quantities of must be given both as mass of refrigerant [kg] and as Tonnes of CO_2 Equivalent.

Use the following rule for computation:

$$\text{Tonnes of } CO_2 = \frac{\text{kg of refrigerant x GWP of refrigerant}}{1000}$$

where:

Refrigerant	GWP
R513A	631
R134a	1430
R1234ze	7
R410A	2088

b Our packaged units (not split) operating with F-gas are usually full charged on factory and the total amount of refrigerant charge is already reported on the label. In this case, the label has no need of further written information.

c In general, the above mentioned information has been located in the main nameplate of relevant unit.

d For equipment with double refrigeration circuits, in regards to differentiates requirements on the basis of the quantity of F-gas contained, the required information about refrigerant charge quantities has to be listed separately for each individual circuit.

e For equipments with separate indoor and outdoor sections connected by refrigerant piping, the label information will be on that part of the equipment which is initially charged with the refrigerant. In case of a split system (separate indoor and outdoor sections) without a factory pre-charge of refrigerant, the mandatory label information will be on that part of the product or equipment which contains the most suitable service points for charging or recovering the fluorinated greenhouse gas(es).

NOTE: *Safety data sheets of F-gases used in the products are available on demand.*

13.7 Record Keeping

Operators of equipment which is required to be checked for leaks (see *13.5 Leakage Detection*), shall establish and maintain records for each piece of such equipment specifying the following information:

a	the quantity and type of fluorinated greenhouse gases installed
b	the quantities of fluorinated greenhouse gases added during installation, maintenance or servicing or due to leakage
c	whether the quantities of installed fluorinated greenhouse gases have been recycled or reclaimed, including the name and address of the recycling or reclamation facility and, where applicable, the certificate number
d	the quantity of fluorinated greenhouse gases recovered
e	the identity of the undertaking which installed, serviced, maintained and where applicable repaired or decommissioned the equipment, including, where applicable, the number of its certificate
f	the dates and results of the leak checks carried out (see *13.5 Leakage Detection*)
g	if the equipment was decommissioned, the measures taken to recover and dispose of the fluorinated greenhouse gases

Unless the records are stored in a database set up by the competent authorities of the Member States the following rules apply:

a	the operators shall keep the records for at least **five** years
b	undertakings carrying out activities for operators shall keep copies of the records for at least **five** years

NOTICE

R1234ze is not a F-Gas, but it's a A2L (mildly flammable) refrigerant; for this reason Vertiv™ recommend to keep the highest frequency of refrigerant leak check (as per *13.4.2 table*) for safety issues; for the same reason Vertiv™ recommend to maintain the record keeping as indicated on *13.7 Record Keeping.*

NOTICE

When the unit is subjected to fire, safety devices prevent rupture due to over-pressure by releasing refrigerant. The fluid may then be decomposed into toxic residues when subjected to the flame:

- Stay away from the unit.
- Set up warnings and recommendations for personnel in charge to stop the fire.
- Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.

Annex I – Dimensions and Weights

Weights

Chiller models	CH4/CH3 065	CH4/CH3 075	CH4/CH3 080	CH4/CH3 090	CH4/CH3 100	CH4/CH3 110	CH4/CH3 125	CH4/CH3 140	CH4/CH3 165	CH4/CH3 180
Net Weight [kg]	6202	6234	6796	6847	8604	9035	9582	9774	10914	11651
Weight included water [kg]	6556	6588	7130	7181	9512	9971	10517	10752	11993	12698

Chiller models	CH4/CH3 195	CIZ 065	CIZ 075	CIZ 080	CIZ 085	CIZ 095	CIZ 110	CIZ 125	CIZ 140	CIZ 150
Net Weight [kg]	11724	5538	5548	6695	7295	8456	9005	9567	10812	11393
Weight included water [kg]	12723	5892	5902	7029	7629	9364	9940	10518	11860	11860

Freecooling models	FH4/FH3 065	FH4/FH3 075	FH4/FH3 080	FH4/FH3 090	FH4/FH3 100	FH4/FH3 110	FH4/FH3 125	FH4/FH3 140	FH4/FH3 165	FH4/FH3 180
Net Weight [kg]	7507	7540	8332	8384	10550	10980	11770	11963	13280	14247
Weight included water [kg]	8275	8307	9159	9210	12106	12565	13437	13672	15171	16191

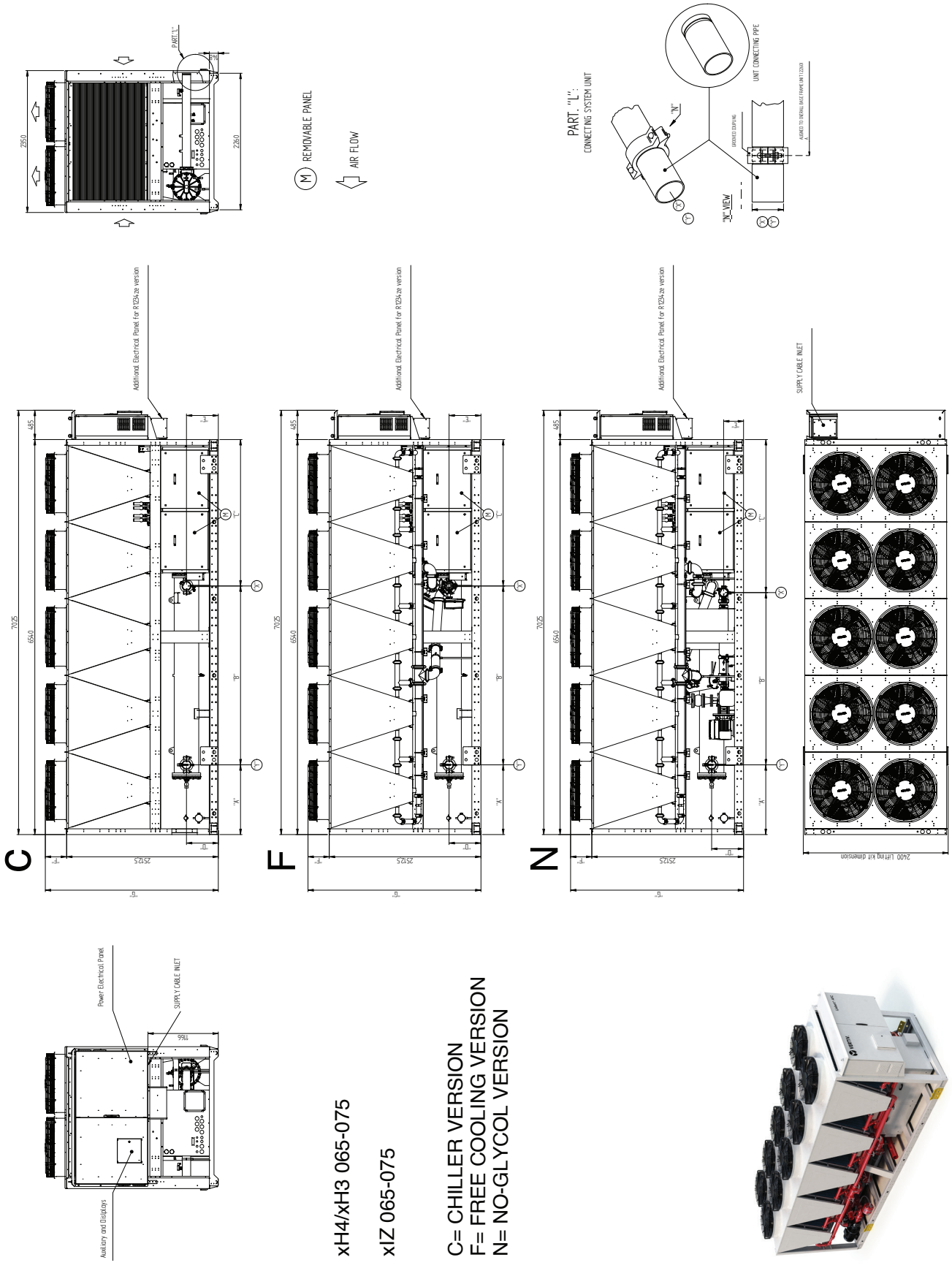
Freecooling models	FH4/FH3 195	FIZ 065	FIZ 075	FIZ 080	FIZ 085	FIZ 095	FIZ 110	FIZ 125	FIZ 140	FIZ 150
Net Weight [kg]	14320	6844	6854	8230	8830	10401	10950	11756	13178	13990
Weight included water [kg]	16214	7612	7622	9098	9697	11958	12535	13438	15037	15901

Freecooling glycol-free models	NH4/NH3 065	NH4/NH3 075	NH4/NH3 080	NH4/NH3 090	NH4/NH3 100	NH4/NH3 110	NH4/NH3 125	NH4/NH3 140	NH4/NH3 165	NH4/NH3 180
Net Weight [kg]	7708	7740	8742	8793	11035	11466	12231	12423	14134	15154
Weight included water [kg]	8664	8696	9816	9867	12938	13398	14300	14535	16621	17774

Freecooling glycol-free models	NH4/NH3 195	NIZ 065	NIZ 075	NIZ 080	NIZ 085	NIZ 095	NIZ 110	NIZ 125	NIZ 140	NIZ 150
Net Weight [kg]	15226	7044	7054	8640	9240	10887	11435	12216	13933	14785
Weight included water [kg]	17798	8000	8010	9699	10299	12791	13367	14350	16388	17285

NOTE: *Weights refer to basic inversion units without options/accessories. Please refer to the unit nameplate for the exact weight value.*

Overall dimensions - 10 Fans Units



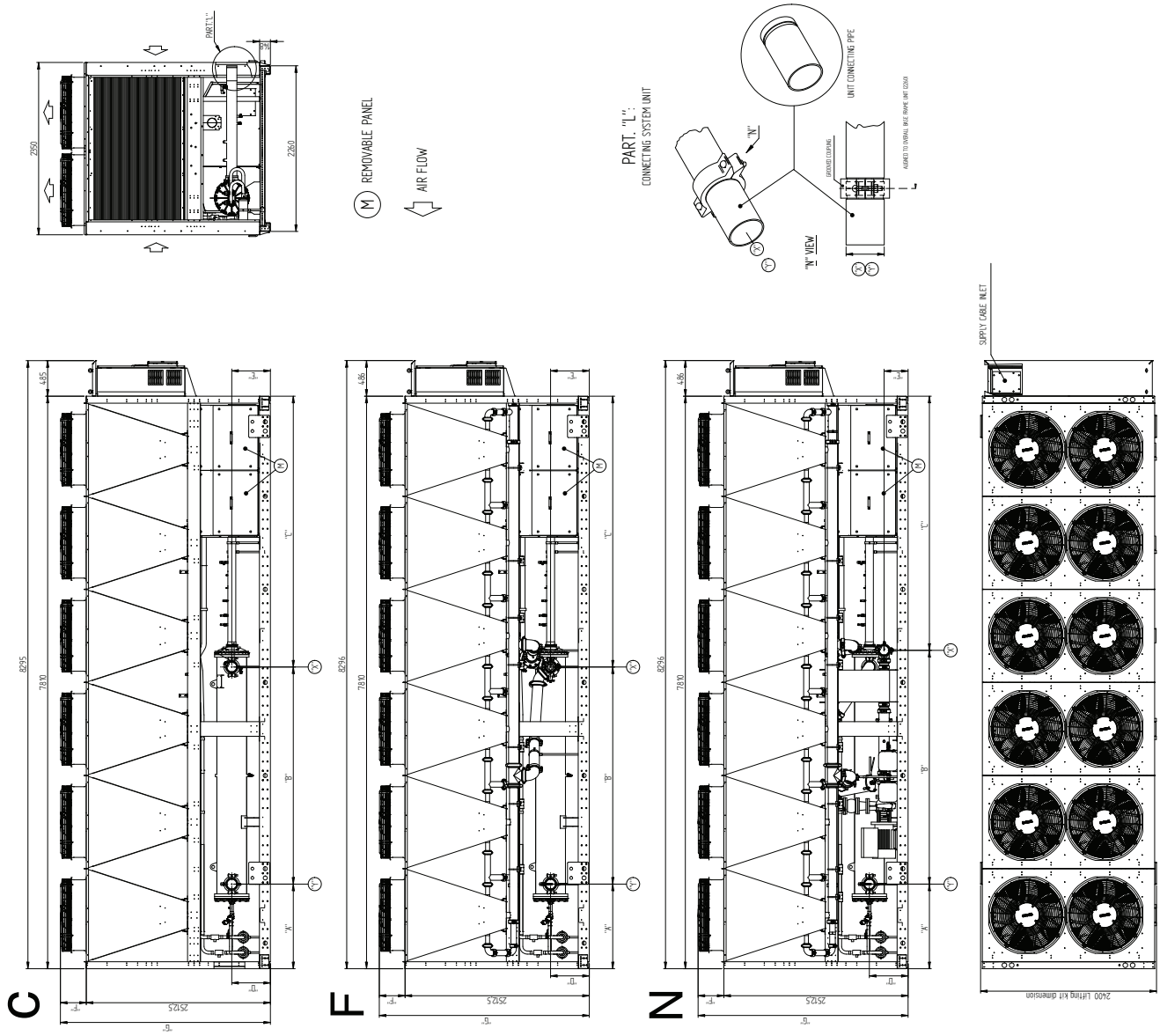
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 065 CH4/CH3 065	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498,5	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498,5	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498,5	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 075 CH4/CH3 075	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498,5	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 065 FH4/FH3 065	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498,5	2617,5	2424	711	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2599	2424	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1515	2601	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 075 FH4/FH3 075	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 065 NH4/NH3 065	With out Pumps	10	1154	2852	2534	527,5	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498,5	2507,5	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1515	2491	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 075 NH4/NH3 075	With out Pumps	10	1154	2852	2534	527,5	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1517	2489	2534	714	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

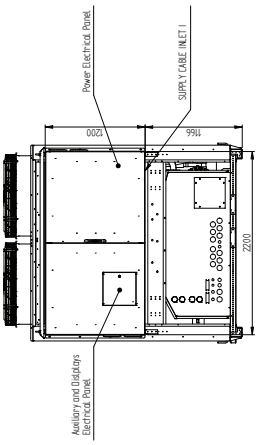
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 065 CH4/CH3 065	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 075 CH4/CH3 075	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 065 FH4/FH3 065	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2599	2424	702	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2601	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 075 FH4/FH3 075	With out Pumps	10	1154	2962	2424	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1515	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 065 NH4/NH3 065	With out Pumps	10	1154	2852	2534	527,5	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2507,5	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498	2491	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 075 NH4/NH3 075	With out Pumps	10	1154	2852	2534	527,5	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2489	2534	714	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2489	2534	714	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 065 CH4/CH3 065	With 2 Pumps std low press.	10	1499	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498,5	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1497,5	2618,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 075 CH4/CH3 075	With 2 Pumps std low press.	10	1499	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 065 FH4/FH3 065	With 2 Pumps std low press.	10	1499	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2599	2424	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1515	2601	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 075 FH4/FH3 075	With 2 Pumps std low press.	10	1517	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 065 NH4/NH3 065	With 2 Pumps std low press.	10	1498,5	2507,5	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1515	2491	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 075 NH4/NH3 075	With 2 Pumps std low press.	10	1517	2489	2534	713	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 065 CH4/CH3 065	With 2 Pumps std low press.	10	1498	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498,0	2617,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1498,0	2618,5	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 075 CH4/CH3 075	With 2 Pumps std low press.	10	1498	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 065 FH4/FH3 065	With 2 Pumps std low press.	10	1498	2617	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2599	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2601	2424	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 075 FH4/FH3 075	With 2 Pumps std low press.	10	1498	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1515	2599	2424	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 065 NH4/NH3 065	With 2 Pumps std low press.	10	1498,0	2507,5	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1499	2491	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 075 NH4/NH3 075	With 2 Pumps std low press.	10	1498	2489	2534	734	329	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2489	2534	714	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2489	2534	714	329	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Overall dimensions - 12 Fans Units

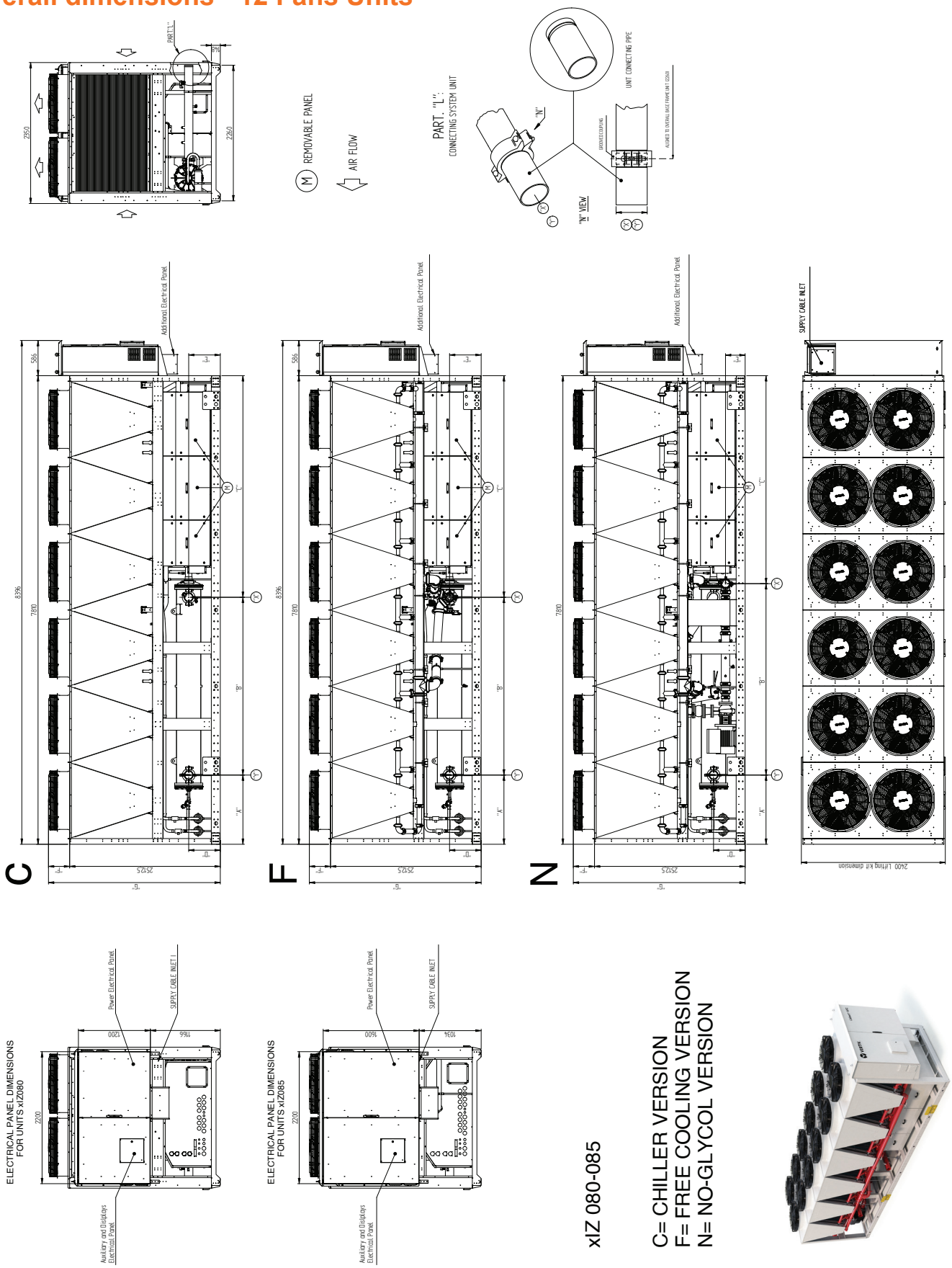




xH4/xH3 080-090

C= CHILLER VERSION
F= FREE COOLING VERSION
N= NO-GLYCOL VERSION

Overall dimensions - 12 Fans Units



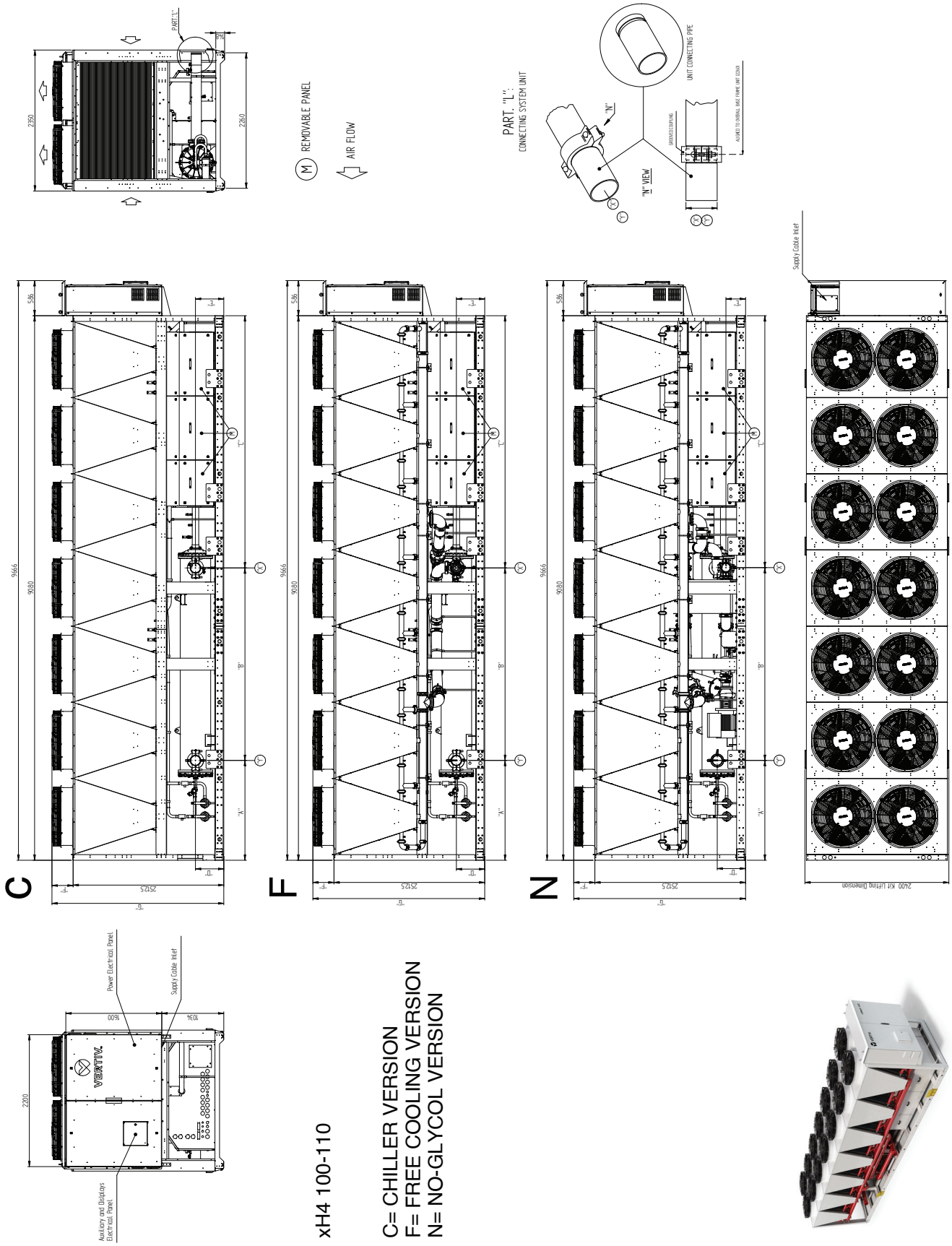
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 080 CH4/CH3 080	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498,5	2617,5	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2599	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2599	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 085 CH4/CH3 090	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1517	2599	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 080 FH4/FH3 080	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1516	2600	3694	713	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 085 FH4/FH3 090	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 080 NH4/NH3 080	With out Pumps	12	1154	3189	3467	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1517	2826	3467	714	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 085 NH4/NH3 090	With out Pumps	12	1154	3189	3467	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1517	2826	3467	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 080 CH4/CH3 080	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1499	2617,5	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 085 CH4/CH3 090	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1499	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 080 FH4/FH3 080	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1514	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 085 FH4/FH3 090	With out Pumps	12	1154	2962	3694	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1516	2600	3694	713	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 080 NH4/NH3 080	With out Pumps	12	1154	3189	3467	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2826	3467	735	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 085 NH4/NH3 090	With out Pumps	12	1154	3189	3467	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With Pumps std low press.		1498	2826	3467	735	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

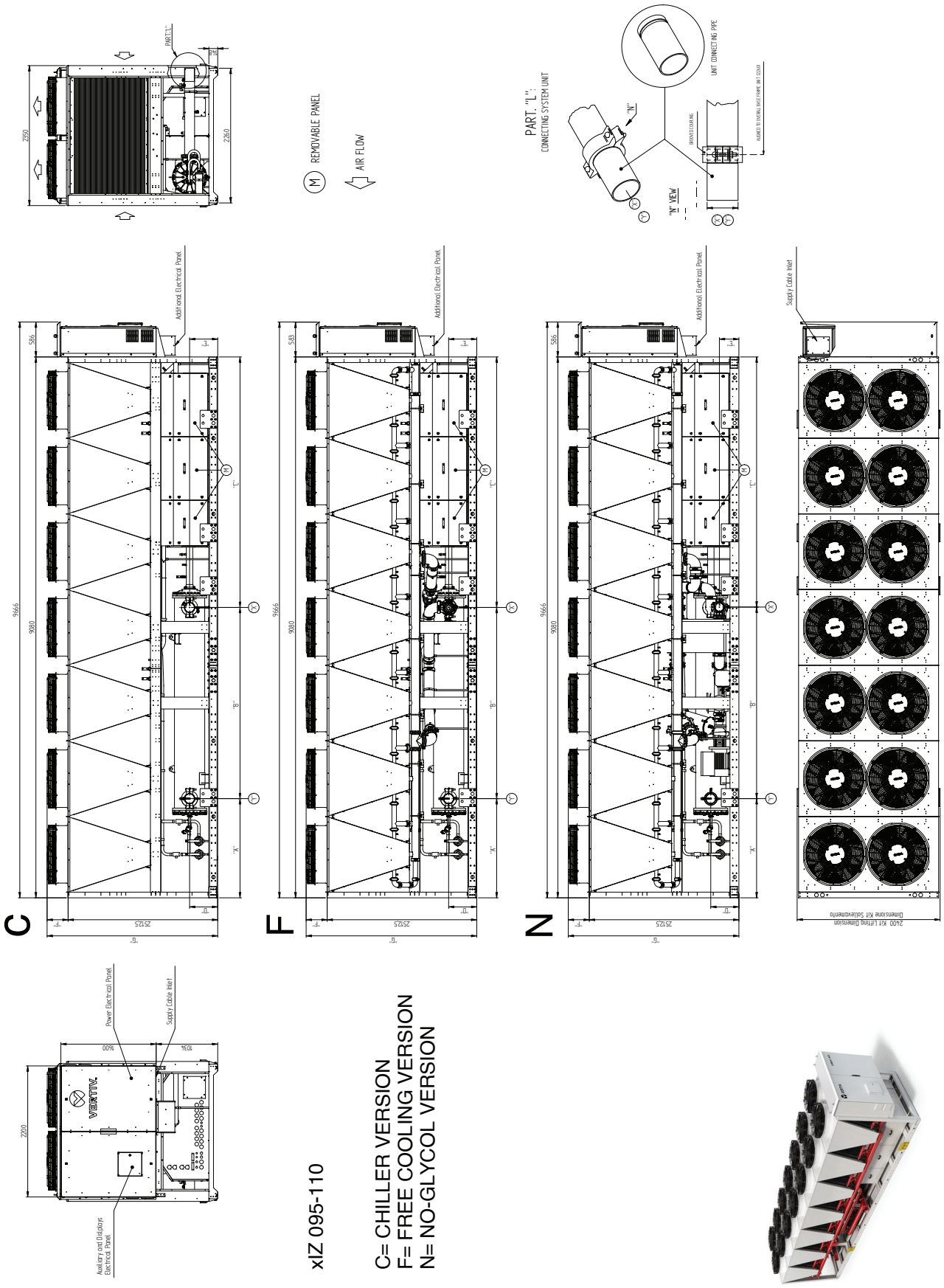
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 080 CH4/CH3 080	With 2 Pumps std low press.	12	1498,5	2617,5	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2599	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2599	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 085 CH4/CH3 090	With 2 Pumps std low press.	12	1518	2598	3694	713	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 080 FH4/FH3 080	With 2 Pumps std low press.	12	1516	2600	3694	711	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 085 FH4/FH3 090	With 2 Pumps std low press.	12	1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 080 NH4/NH3 080	With 2 Pumps std low press.	12	1517	2826	3467	714	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1517	2826	3467	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 085 NH4/NH3 090	With 2 Pumps std low press.	12	1517	2826	3467	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1517	2826	3467	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2827	3467	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 080 CH4/CH3 080	With 2 Pumps std low press.	12	1499	2617,5	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 085 CH4/CH3 090	With 2 Pumps std low press.	12	1499	2598	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1498	2599	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 080 FH4/FH3 080	With 2 Pumps std low press.	12	1498	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1514	2600	3694	734	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 085 FH4/FH3 090	With 2 Pumps std low press.	12	1514	2600	3694	714	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2600	3694	733	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 080 NH4/NH3 080	With 2 Pumps std low press.	12	1499	2826	3467	735	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 085 NH4/NH3 090	With 2 Pumps std low press.	12	1499	2826	3467	735	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN125-5"-139,7	Outlet	Grooved pipes connections DN125-5"-139,7
	With 2 Pumps high press.		1516	2826	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1516	2827	3467	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Overall dimensions - 14 Fans Units



Overall dimensions - 14 Fans Units



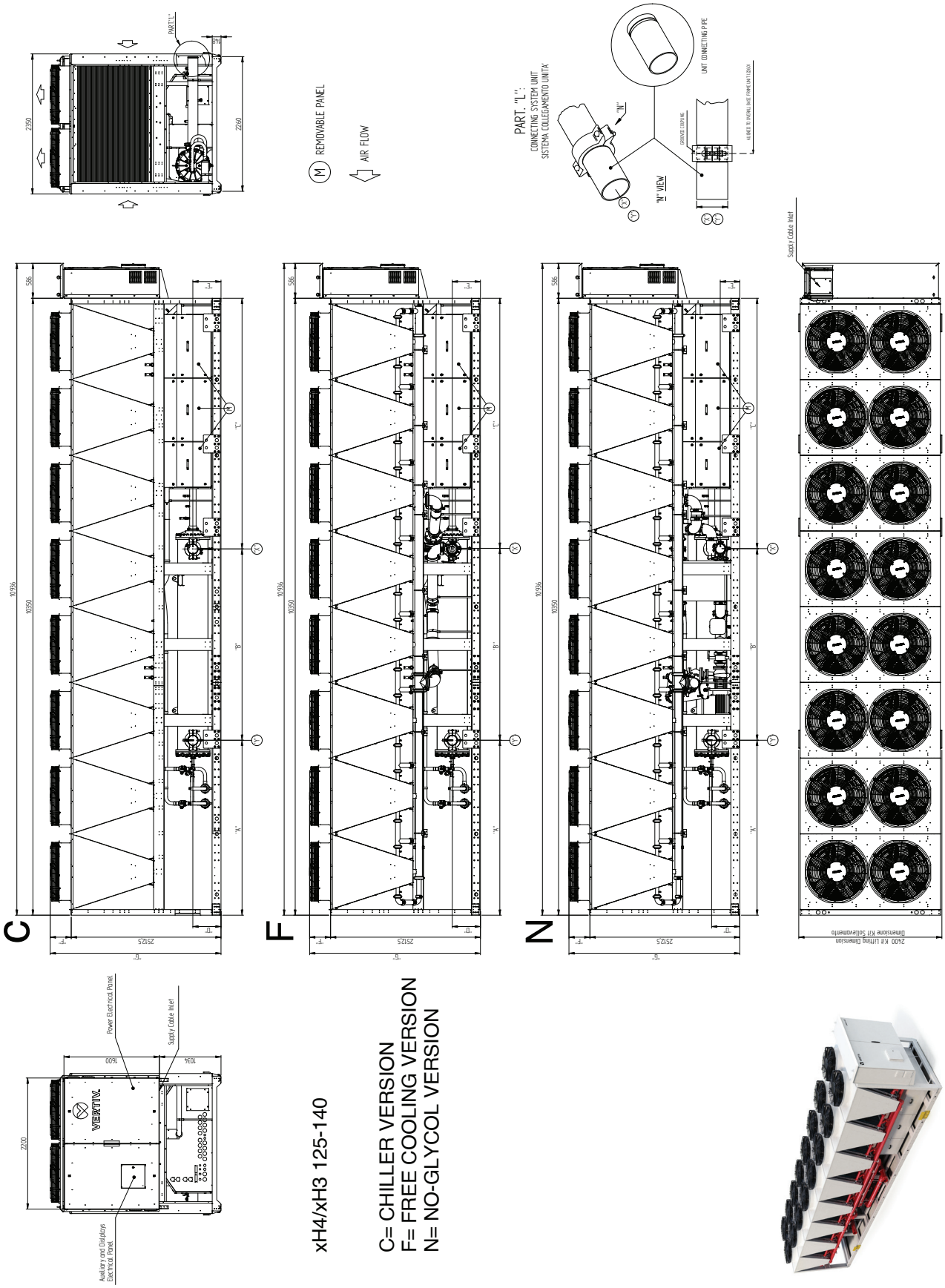
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 095 CH4/CH3 100	With out Pumps	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 110 CH4/CH3 110	With out Pumps	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 095 FH4/FH3 100	With out Pumps	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 110 FH4/FH3 110	With out Pumps	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3272	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1685	3190	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1685	3190	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 095 NH4/NH3 100	With out Pumps	14	1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 110 NH4/NH3 110	With out Pumps	14	1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pumps std low press.		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pumps high press.		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With inverter Pump		1603	3277	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Model	Single Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Base Fans F (mm)	Base Fans G (mm)	Premium Fans F (mm)	Premium Fans G (mm)	Low Noise Fans F (mm)	Low Noise Fans G (mm)	Chilled water connections "X" (mm)		Chilled water connections 2962"Y" (mm)	
CIZ 095 CH4/CH3 100	Without Pump	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 110 CH4/CH3 110	Without Pump	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 095 FH4/FH3 100	Without Pump	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 110 FH4/FH3 110	Without Pump	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 09 NH4/NH3 100	Without Pump	14	1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 110 NH4/NH3 110	Without Pump	14	1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

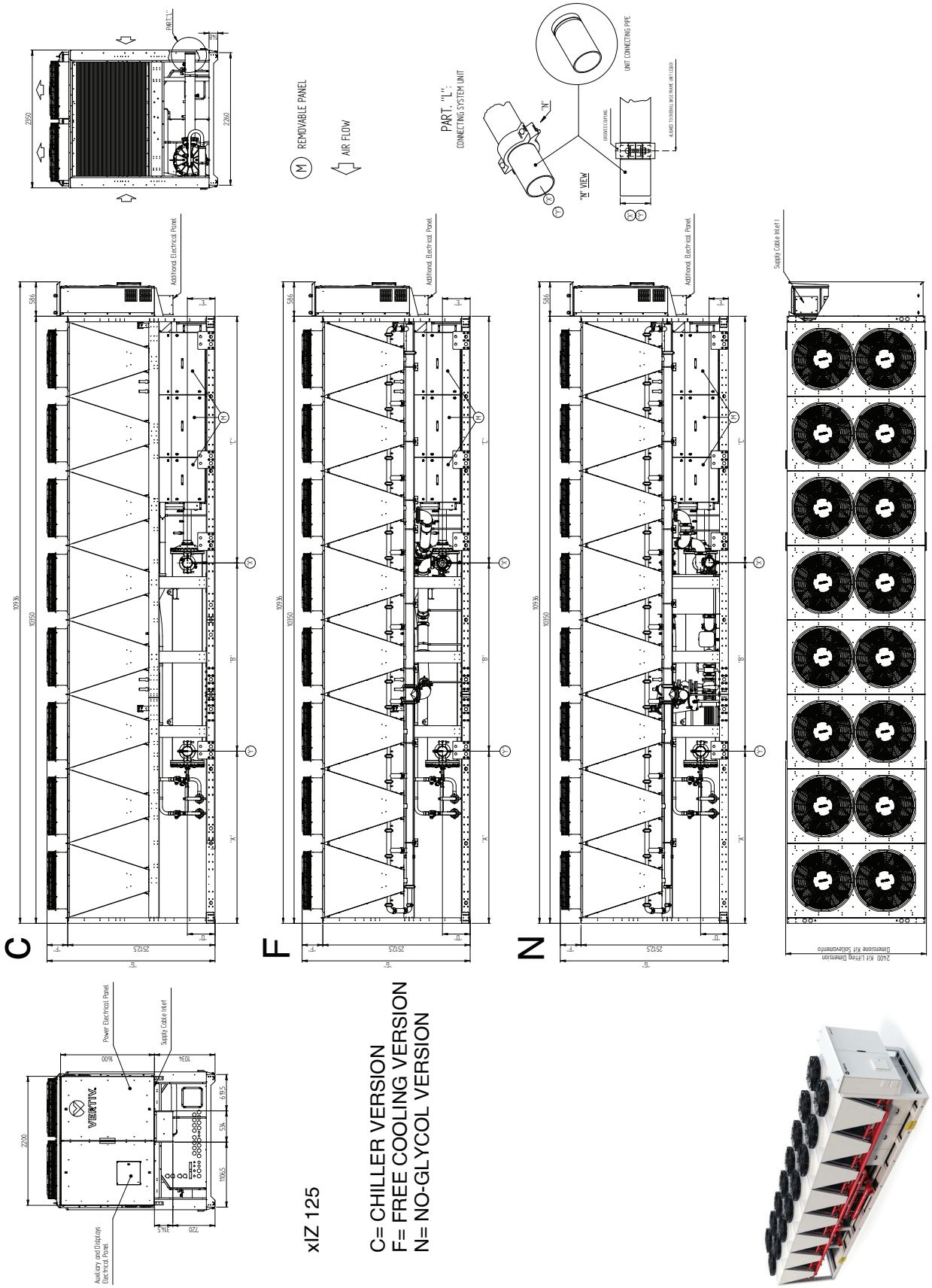
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 095 CH4/CH3 100	With 2 Pumps std low press.	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 110 CH4/CH3 110	With 2 Pumps std low press.	14	1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 095 FH4/FH3 100	With 2 Pumps std low press.	14	1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 110 FH4/FH3 110	With 2 Pumps std low press.	14	1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1665	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3320	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 095 NH4/NH3 100	With 2 Pumps std low press.	14	1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 110 NH4/NH3 110	With 2 Pumps std low press.	14	1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1665	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Base Fans F (mm)	Base Fans G (mm)	Premium Fans F (mm)	Premium Fans G (mm)	Low Noise Fans F (mm)	Low Noise Fans G (mm)	Chilled water connections "X" (mm)		Chilled water connections 2962"Y" (mm)	
CIZ 095 CH4/CH3 100	With 2 Pumps std low press.	14	1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CIZ 110 CH4/CH3 100	With 2 Pumps std low press.	14	1537	3338	4205	734	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3320	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 095 FH4/FH3 100	With 2 Pumps std low press.	14	1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 110 FH4/FH3 110	With 2 Pumps std low press.	14	1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1554	3321	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 095 NH4/NH3 110	With 2 Pumps std low press.	14	1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 110 NH4/NH3 110	With 2 Pumps std low press.	14	1536	3344	4200	734	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		1555	3325	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Overall dimensions - 16 Fans Units



Overall dimensions - 16 Fans Units



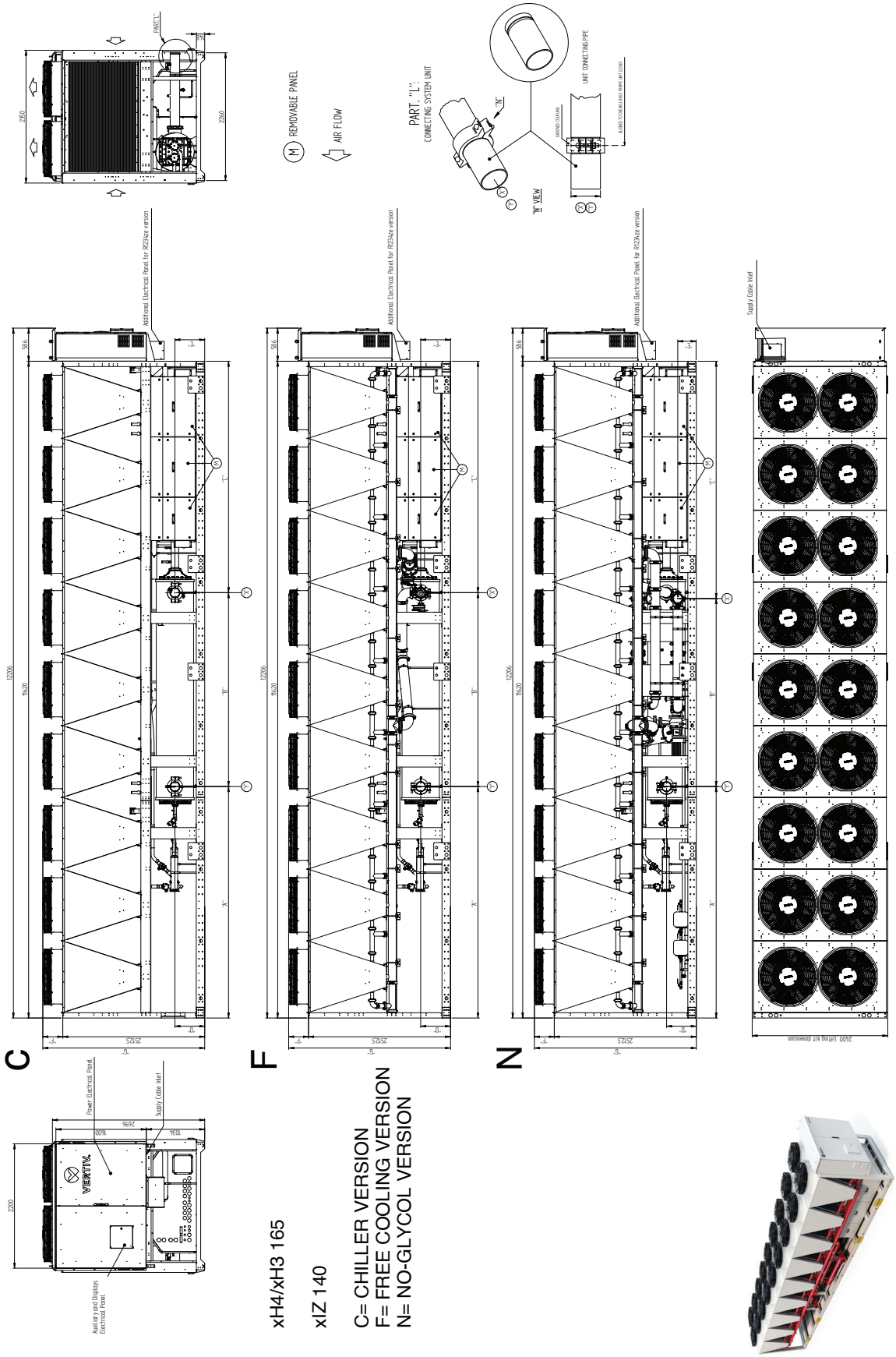
								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 125 CH4/CH3 125	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 140	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 12 FH4/FH3 125	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 140	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2625	3520	4205	783	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 125 NH4/NH3 125	Without Pump	16	2935	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2375	3775	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 140	Without Pump	16	2935	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2375	3775	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 12 CH4/CH3 125	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2327	3818	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2327	3818	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2327	3818	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 140	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2376	3769	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2376	3769	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 125 FH4/FH3 125	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2376	3769	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 140	Without Pump	16	2935	3210	4205	472,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2376	3769	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 125 NH4/NH3 125	Without Pump	16	2935	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2327	3823	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2327	3823	4200	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2327	3823	4200	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 140	Without Pump	16	2935	3215	4200	472,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		2376	3774	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		2375	3775	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		2376	3774	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version S ΔT=6°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 125 CH4/CH3 125	With 2 Pumps std low press.	16	2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 140	With 2 Pumps std low press.	16	2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 125 FH4/FH3 125	With 2 Pumps std low press	16	2375	3770	4205	783	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 140	With 2 Pumps std low press	16	2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2625	3520	4205	783	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 125 NH4/NH3 125	With 2 Pumps std low press.	16	2375	3775	4200	783	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 140	With 2 Pumps std low press.	16	2375	3775	4200	783	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3824	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 125 CH4/CH3 125	With 2 Pumps std low press.	16	2327	3818	4205	713	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3819	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3819	4205	733	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 140	With 2 Pumps std low press.	16	2376	3769	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 125 FH4/FH3 125	With 2 Pumps std low press.	16	2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 140	With 2 Pumps std low press.	16	2375	3770	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3819	4205	783,5	472,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 125 NH4/NH3 125	With 2 Pumps std low press.	16	2327	3823	4200	713	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2327	3823	4200	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2326	3824	4200	733	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 140	With 2 Pumps std low press.	16	2375	3775	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2375	3775	4200	783	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2375	3775	4200	783,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

Overall dimensions - 18 Fans Units



xH4/xH3 165

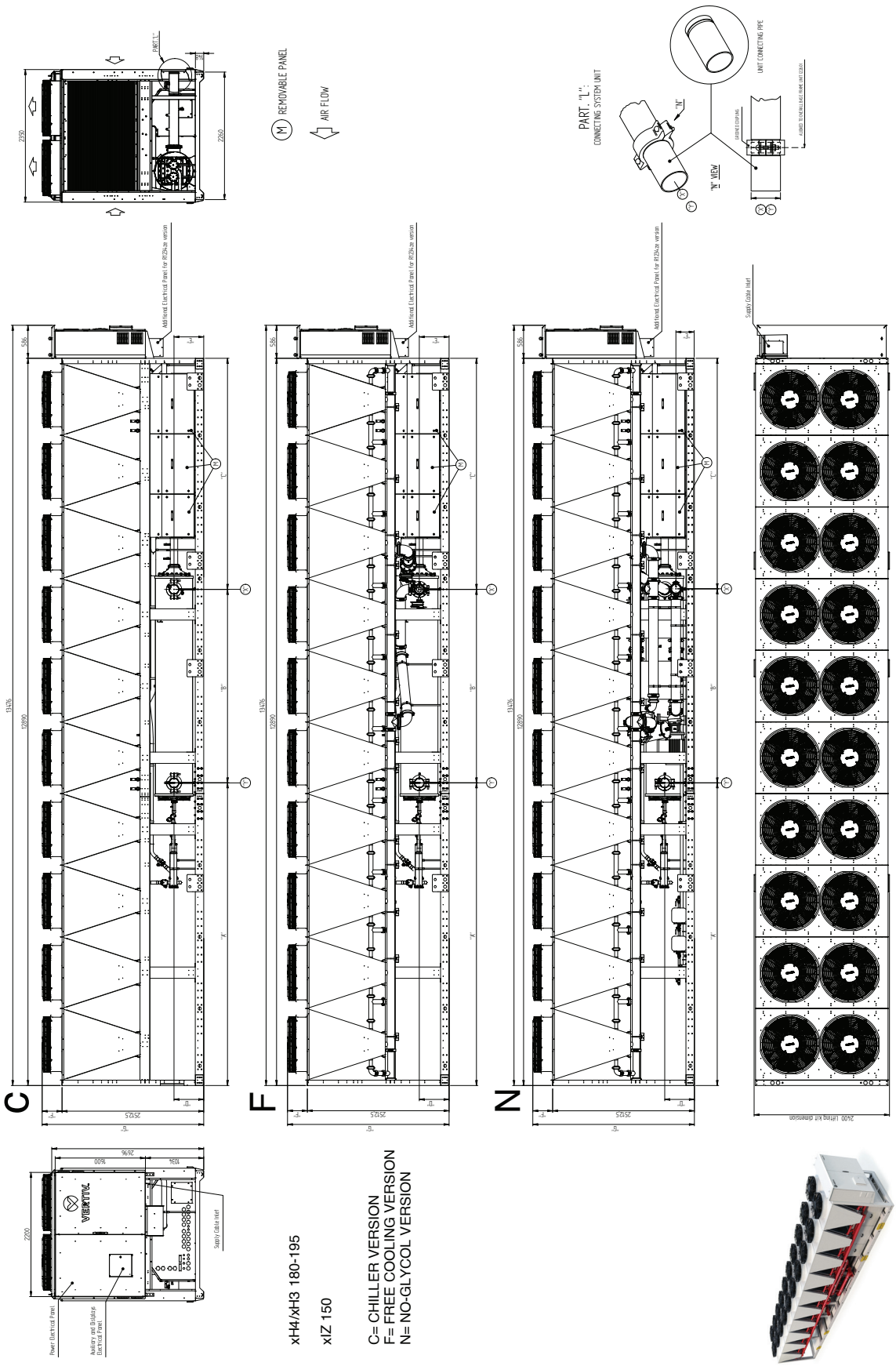
xIZ 140

C= CHILLER VERSION
F= FREE COOLING VERSION
N= NO-GLYCOL VERSION

Model	Single Pump Version H ΔT= 9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Base Fans F (mm)	Base Fans G (mm)	Premium Fans F (mm)	Premium Fans G (mm)	Low Noise Fans F (mm)	Low Noise Fans G (mm)	Chilled water connections "X" (mm)		Chilled water connections 2962"Y" (mm)	
CIZ 140	Without Pump	18	4095	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 165	Without Pump	18	4095	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 140	Without Pump	18	4095	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 165	Without Pump	18	4095	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3758	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3758	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 140	Without Pump	18	4095	3326	4199	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 165	Without Pump	18	4095	3326	4199	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With Pump std low press.		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		3809	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 140	With 2 Pumps std low press.	18	2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 165	With 2 Pumps std low press.	18	2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2319	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 140	With 2 Pumps std low press.	18	2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2391	5134	4095	758	527,5	52	2564,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 165	With 2 Pumps std low press.	18	2391	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2342	5183	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2342	5183	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 140	With 2 Pumps std low press.	18	2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 165	With 2 Pumps std low press.	18	2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6"-168.3	Outlet	Grooved pipes connections DN150-6"-168.3
	With 2 Pumps high press.		2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		2391	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

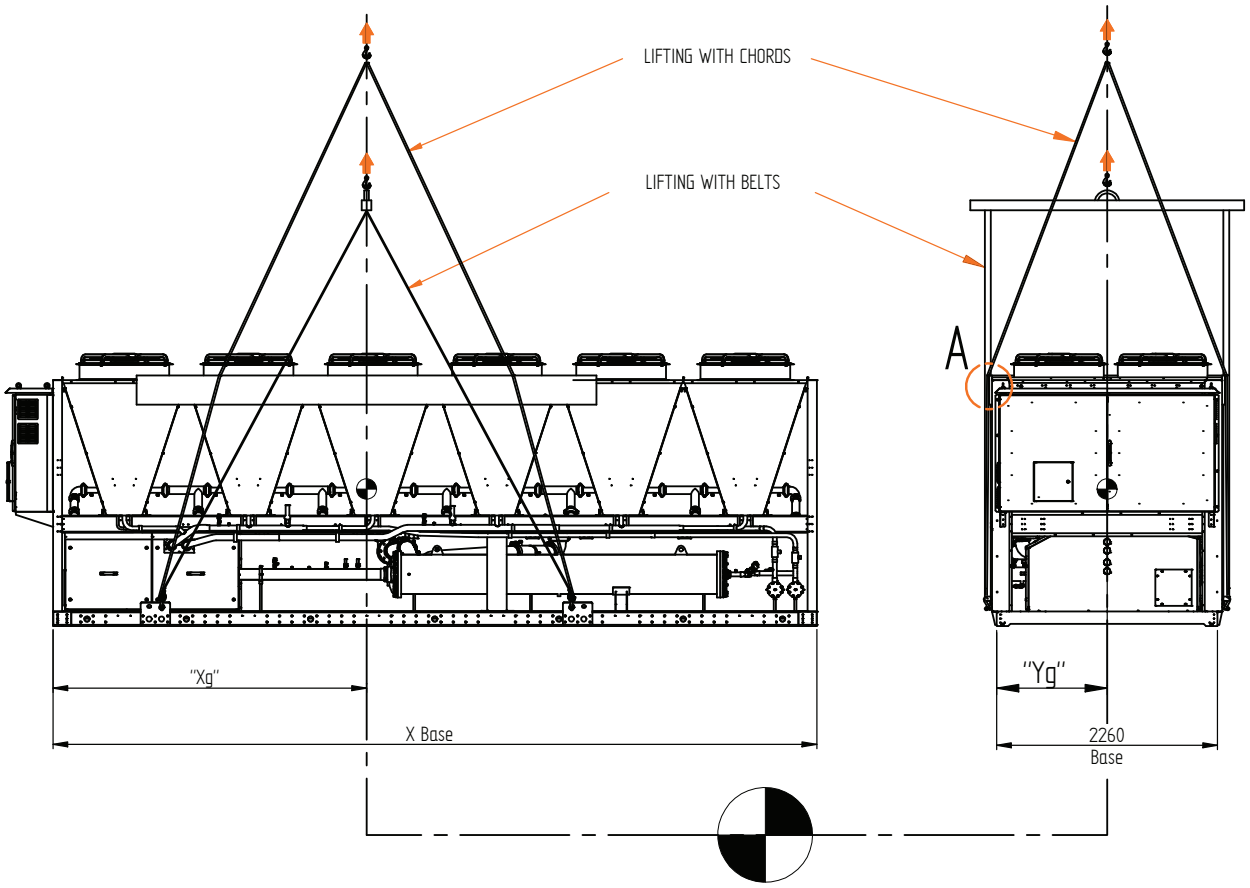
Overall dimensions - 20 Fans Units



									Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Single Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 150	Without Pump	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 180	Without Pump	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 195	Without Pump	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 150	Without Pump	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5028	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5028	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 180	Without Pump	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3716	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5104	3691	4095	783	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5028	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 195	Without Pump / Senza Pompa	20	5365	3430	4095	527,5	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5028	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5104	3691	4095	783	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5028	3767	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 150	Without Pump	20	5365	3326	4199	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3612	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 180	Without Pump	20	5365	3440	4085	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 195	Without Pump	20	5365	3440	4085	527,5	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections DN150-6" -168.3
	With Pump std low press.		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Pump high press.		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With Inverter Pump		5079	3726	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

								Base Fans		Premium Fans		Low Noise Fans		Chilled water connections			
Model	Double Pump Version H ΔT=9°C	N. Fans	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	F (mm)	G (mm)	F (mm)	G (mm)	"X" (mm)		2962"Y" (mm)	
CIZ 150	With 2 Pumps std low press.	20	3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 180	With 2 Pumps std low press.	20	3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
CH4/CH3 195	With 2 Pumps std low press.	20	3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FIZ 150	With 2 Pumps std low press.	20	3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3613	5182	4095	758	527,5	52	2564,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3612	5183	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 180	With 2 Pumps std low press.	20	3661	5134	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3687	5108	4095	783	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3612	5183	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
FH4/FH3 195	With 2 Pumps std low press.	20	3613	5182	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3687	5108	4095	783	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3612	5183	4095	758	527,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NIZ 150	With 2 Pumps std low press.	20	3661	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5030	4199	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 180	With 2 Pumps std low press.	20	3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
NH4/NH3 195	With 2 Pumps std low press.	20	3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet	Grooved pipes connections DN150-6" -168.3	Outlet	Grooved pipes connections® DN150-6" -168.3
	With 2 Pumps high press.		3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	
	With 2 Inverter Pumps		3661	5144	4085	758	327,5	271	2783,5	352,5	2865	332,5	2845	Inlet		Outlet	

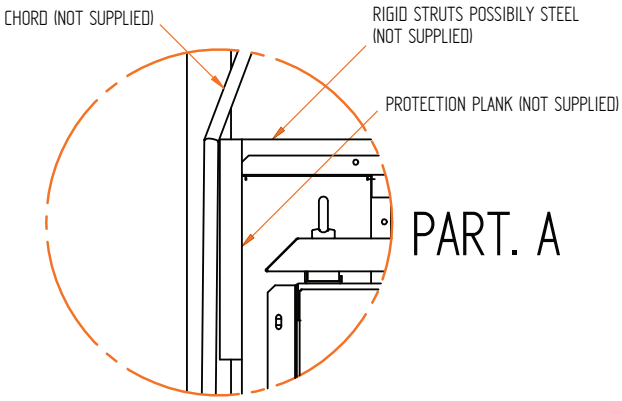
LIFTING BARICENTRIC AXIS WITH 4 BRACKETS



N.B: The lifting point has to be on the vertical baricentric axis, which is individualized by symbols indicated on the base.

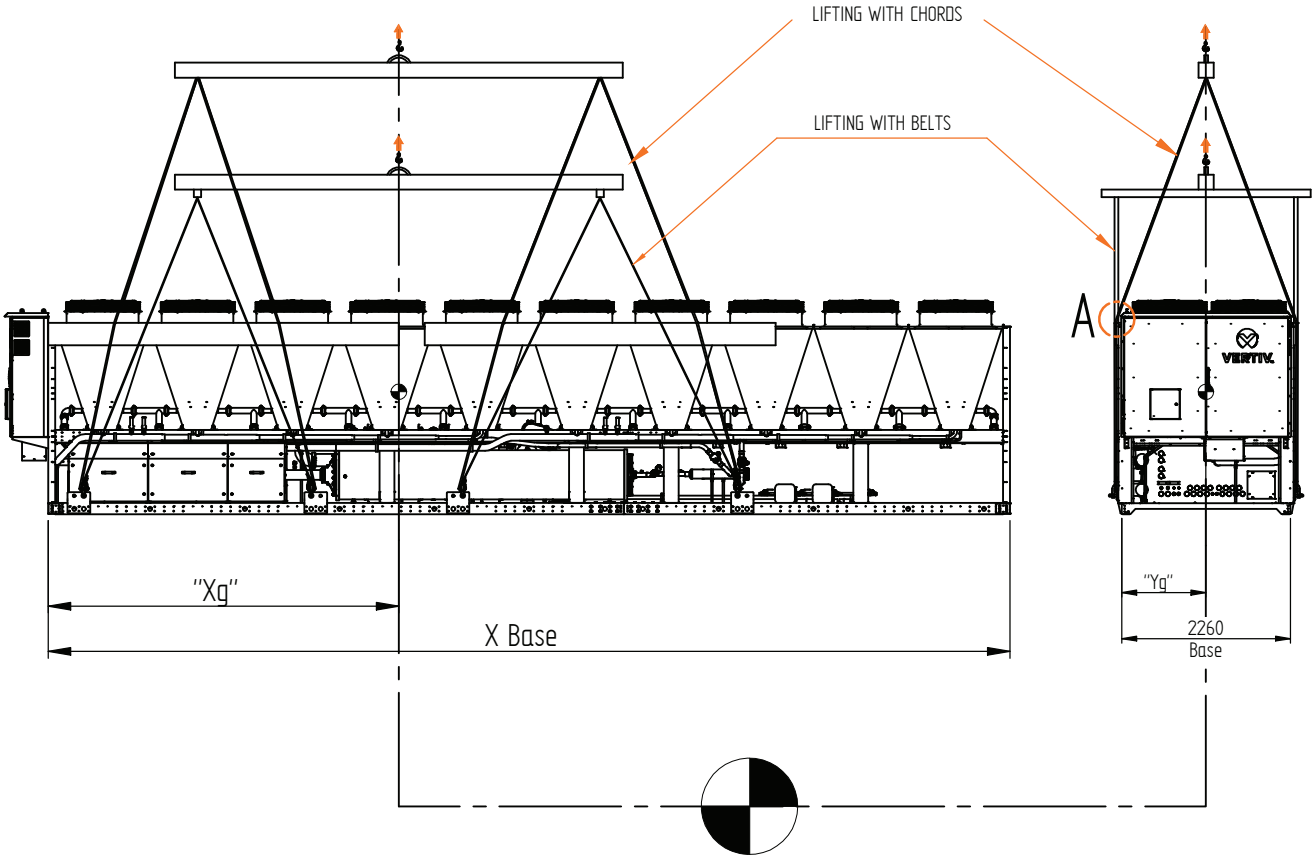
Do not tilt the unit more than 15°

No force must be applied to pressurized parts, especially pipes connected to the condensers or to evaporator.



Please refer to the unit nameplate for the exact weight value.

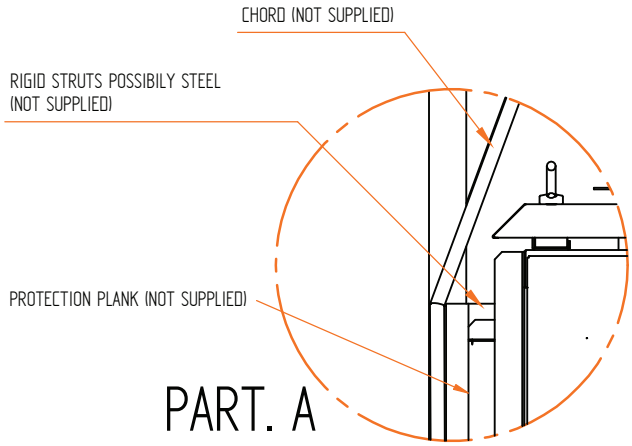
LIFTING BARICENTRIC AXIS WITH 8 BRACKETS



N.B: The lifting point has to be on the vertical baricentric axis, which is individualized by symbols indicated on the base.

Do not tilt the unit more than 15°

No force must be applied to pressurized parts, especially pipes connected to the condensers or to evaporator

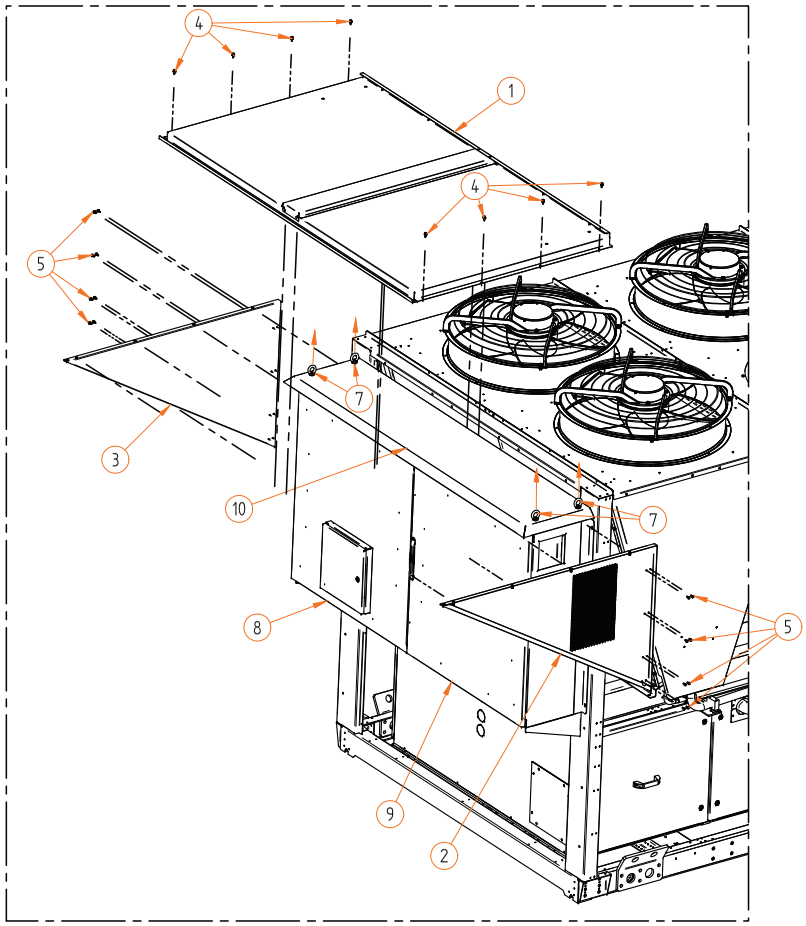


Please refer to the unit nameplate for the exact weight value.

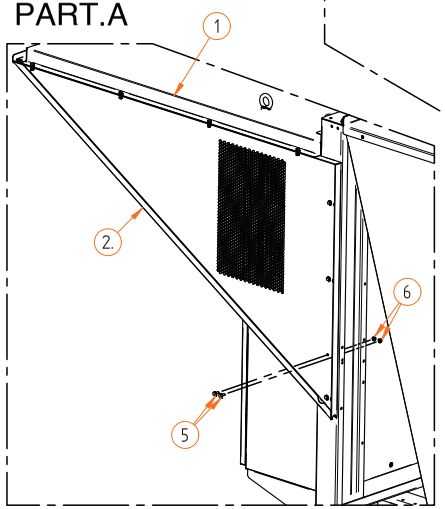
Unit without pumps				
Models	X Base (mm)	Xg (mm)	Yg (mm)	Weight (kg)
Chiller models				
CH4 065	6540	2269	1238	6202
CH4 075	6540	2268	1239	6234
CH4 080	7810	2786	1238	6796
CH4 090	7810	2779	1238	6847
CH4 100	9080	3345	1235	8604
CH4 110	9080	3275	1253	9035
CH4 125	10350	3638	1250	9582
CH4 140	10350	3610	1251	9774
CH4 165	11620	4100	1266	10914
CH4 180	12890	4432	1266	11651
CH4 195	12890	4440	1267	11724
CIZ 065	6540	2481	1228	5538
CIZ 075	6540	2479	1228	5548
CIZ 080	7810	2838	1244	6695
CIZ 085	7810	2953	1258	7295
CIZ 095	9080	3364	1248	8456
CIZ 110	9080	3267	1263	9005
CIZ 125	10350	3636	1260	9567
CIZ 140	11620	4125	1266	10812
CIZ 150	12890	4505	1264	11393
Freecooling models				
FH4 065	6540	2428	1160	7507
FH4 075	6540	2429	1162	7540
FH4 080	7810	2990	1155	8332
FH4 090	7810	2993	1156	8384
FH4 100	9080	3570	1179	10550
FH4 110	9080	3503	1173	10980
FH4 125	10350	3913	1168	11770
FH4 140	10350	3790	1171	11963
FH4 165	11620	4387	1177	13280
FH4 180	12890	4770	1174	14247
FH4 195	12890	4775	1177	14320
FIZ 065	6540	2616	1145	6844
FIZ 075	6540	2614	1145	6854
FIZ 080	7810	3034	1160	8230
FIZ 085	7810	3116	1177	8830
FIZ 095	9080	3588	1165	10401
FIZ 110	9080	3498	1181	10950
FIZ 125	10350	3912	1176	11756
FIZ 140	11620	4410	1177	13178
FIZ 150	12890	4835	1173	13990
Freecooling glycol-free models				
NH4 065	6540	2494	1174	7708
NH4 075	6540	2492	1174	7740
NH4 080	7810	3111	1155	8742
NH4 090	7810	3014	1156	8793
NH4 100	9080	3689	1181	11035
NH4 110	9080	3620	1175	11466
NH4 125	10350	3982	1171	12231
NH4 140	10350	3955	1173	12423
NH4 165	11620	4465	1166	14134
NH4 180	12890	4787	1162	15154
NH4 195	12890	4792	1166	15226
NIZ 065	6540	2681	1159	7044
NIZ 075	6540	2679	1159	7054
NIZ 080	7810	3155	1159	8640
NIZ 085	7810	3225	1176	9240
NIZ 095	9080	3708	1167	10887
NIZ 110	9080	3615	1183	11435
NIZ 125	10350	3981	1178	12216
NIZ 140	11620	4474	1165	13933
NIZ 150	12890	4850	1153	14785

INSTRUCTIONS ASSEMBLY EXTENSION ROOF E.P.

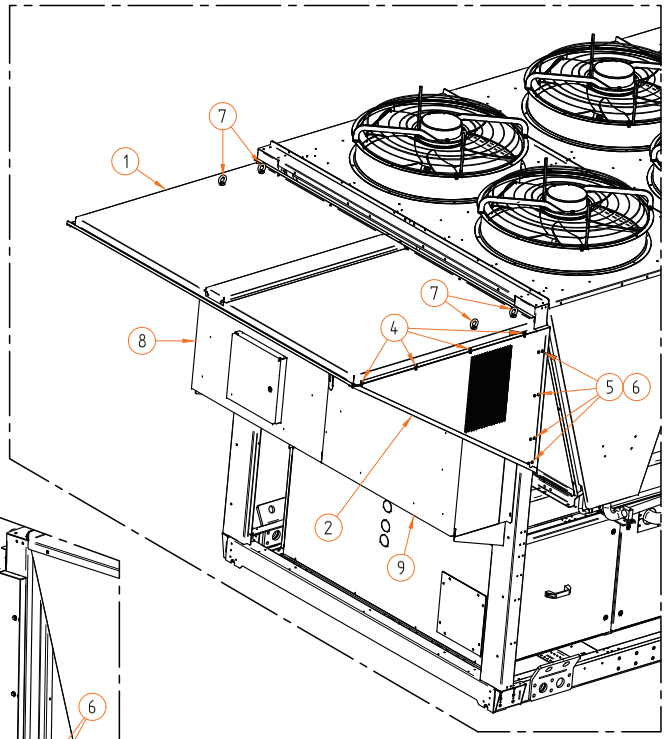
EXPLODED VIEW OF ASSEMBLY



PART.A



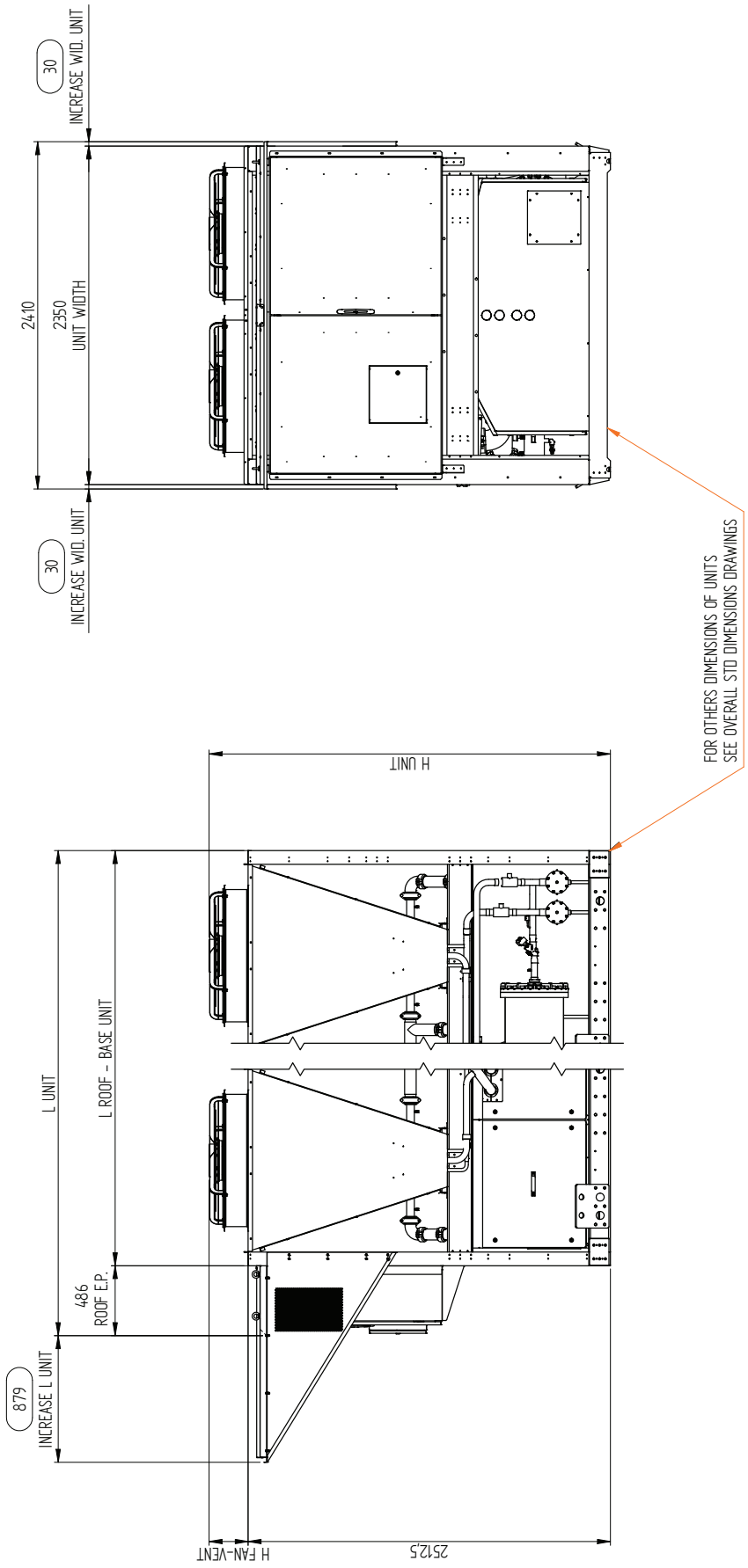
ASSEMBLY COMPLETED



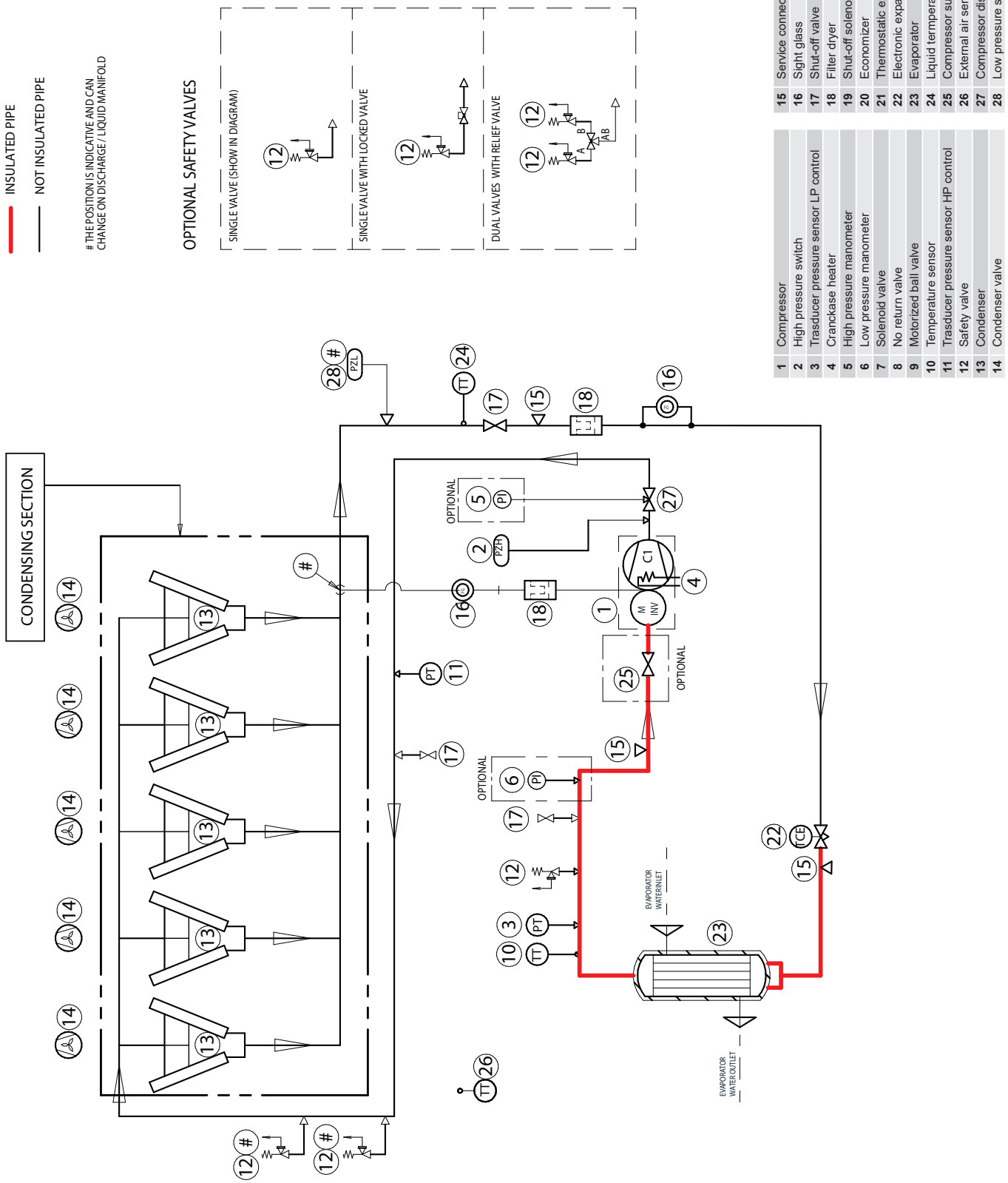
ASSEMBLY STEPS

- Fix triangles (**2**) and (**3**) with 8 screws (**5**) and 8 nuts (**6**) on the present holes of the RH / LH uprights of the unit (as shown in part **A**)
- Disassemble the 4 lifting eyebolts of E.P. Box (**7**) taking care to keep the rain cover of the E.P. (**10**)
- Put extension roof (**1**) over E.P. rain cover (**10**) and triangles (**2**) and (**3**), reassemble the lifting eyebolts (**7**) and fix it with 4 screws (**4**) to the triangles (**2**) and (**3**).
- Open E.P. Box doors LH / RH (**8**) / (**9**) and limit the opening from 110° to about 90°-95° by acting on the position of the mechanical door.
- Stop windproof present.

INCREASE DIMENSIONS OVERALL UNIT WITH EXTENSION ROOF E.P. (OPT.)



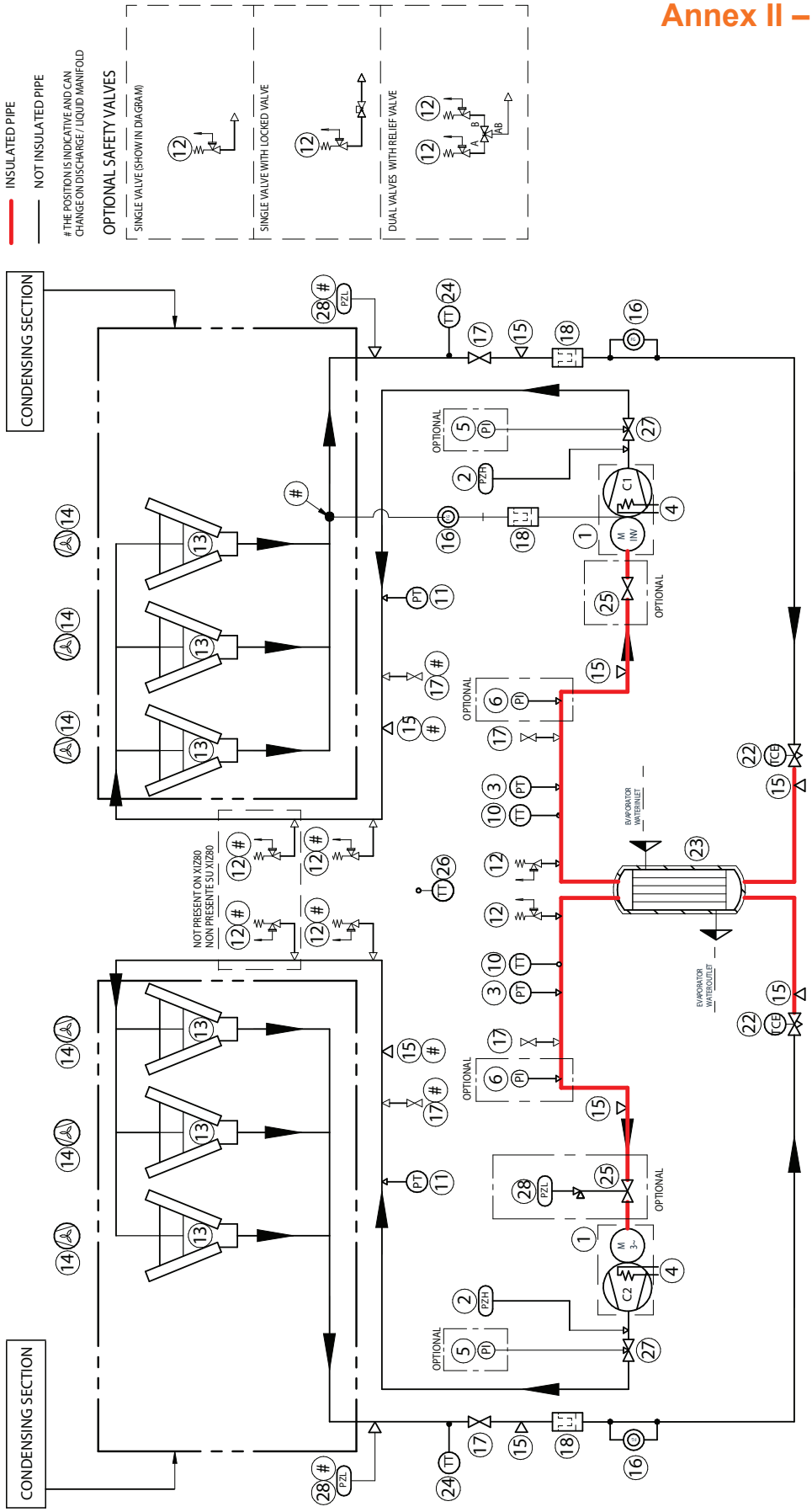
Annex II – Refrigerating Circuit


INSULATED PIPE
NOT INSULATED PIPE
THE POSITION IS INDICATIVE AND CAN CHANGE ON DISCHARGE / LIQUID MANIFOLD
OPTIONAL SAFETY VALVES
SINGLE VALVE (SHOW IN DIAGRAM)
SINGLE VALVE WITH LOCKED VALVE
DUAL VALVES WITH RELIEF VALVE
CONDENSING SECTION
OPTIONAL
EVAPORATOR WATER INLET
EVAPORATOR WATER OUTLET

1	Compressor
2	High pressure switch
3	Trasducer pressure sensor LP control
4	Cranckase heater
5	High pressure manometer
6	Low pressure manometer
7	Solenoid valve
8	No return valve
9	Motorized ball valve
10	Temperature sensor
11	Trasducer pressure sensor HP control
12	Safety valve
13	Condenser
14	Condenser valve

15	Service connection
16	Sight glass
17	Shut-off valve
18	Filter dryer
19	Shut-off solenoid valve
20	Economizer
21	Thermostatic expasion valve
22	Electronic expansion valve
23	Evaporator
24	Liquid temperature sensor
25	Compressor suction valve
26	External air sensor
27	Compressor discharge
28	Low pressure switch

Annex II – Refrigerating Circuit



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25	Compressor suction valve
26	External air sensor
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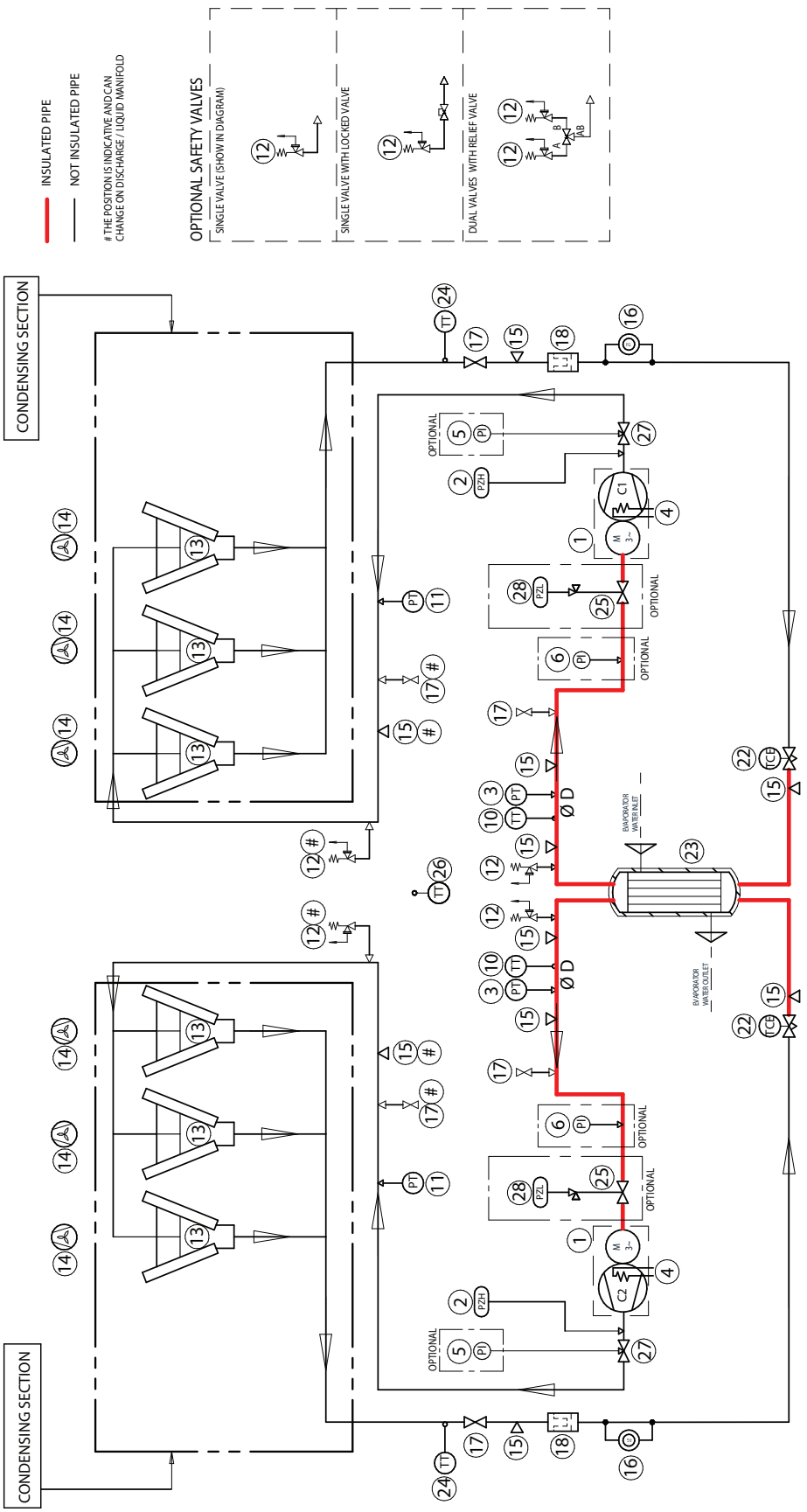
Annex II – Refrigerating Circuit



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15	Service connection
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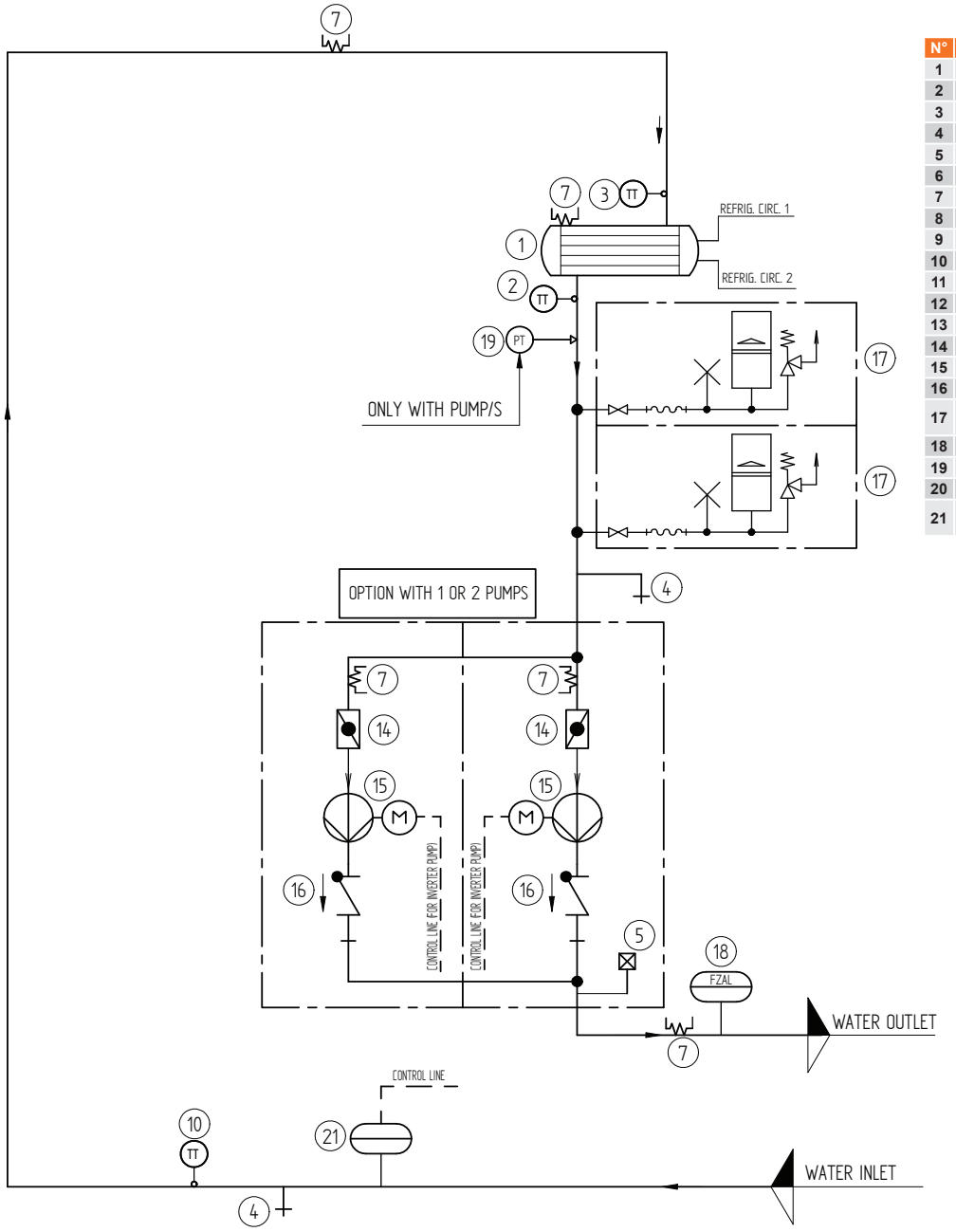
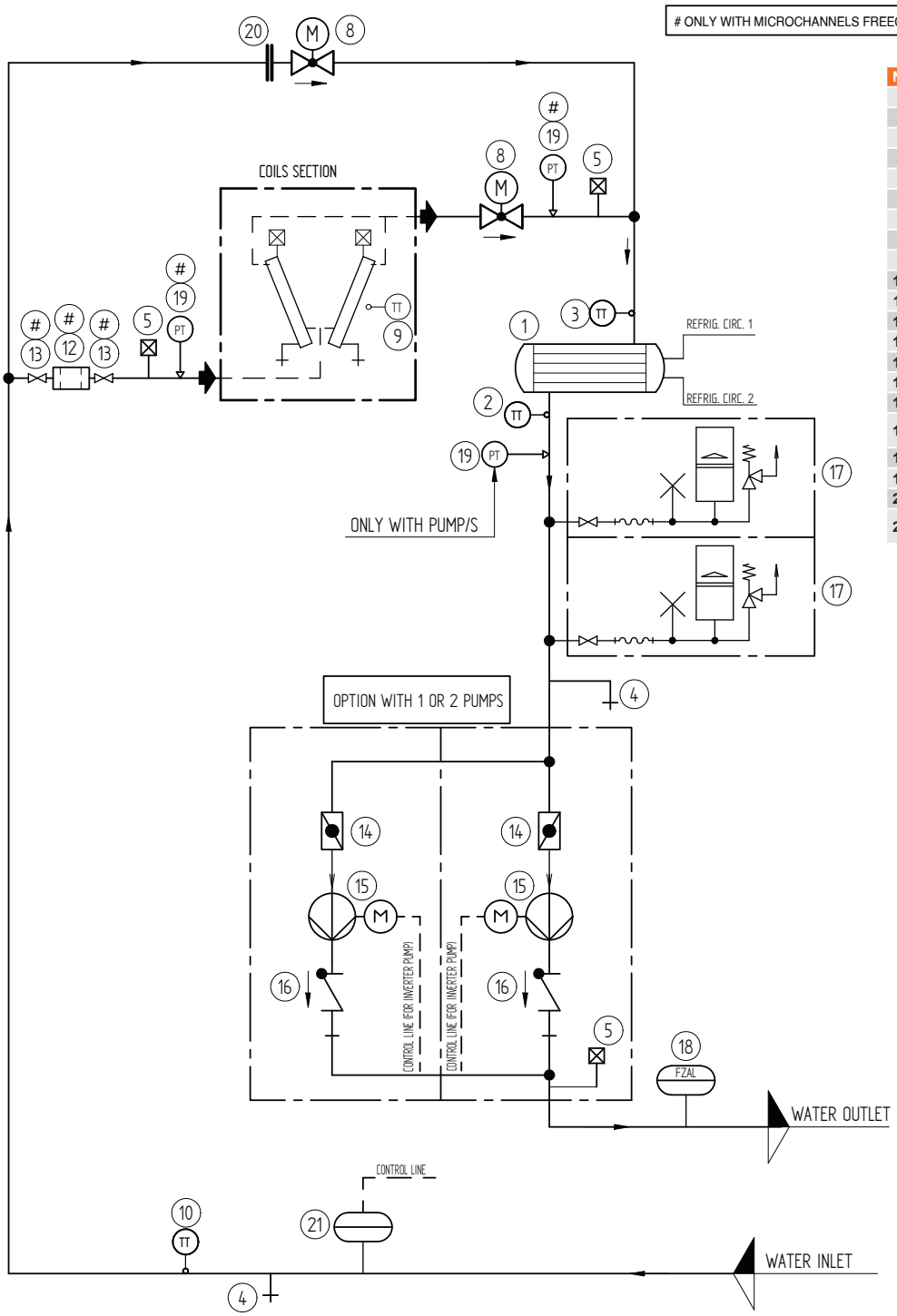
17	Shut-off valve
18	Filter dryer
19	Shut-off solenoid valve
20	Economizer
21	Thermostatic expasion valve
22	Electronic expansion valve
23	Evaporator
24	Liquid temperature sensor
25	Compressor suction valve
26	External air sensor
27	Compressor discharge
28	Low pressure switch

Annex II – Hydraulic Circuit



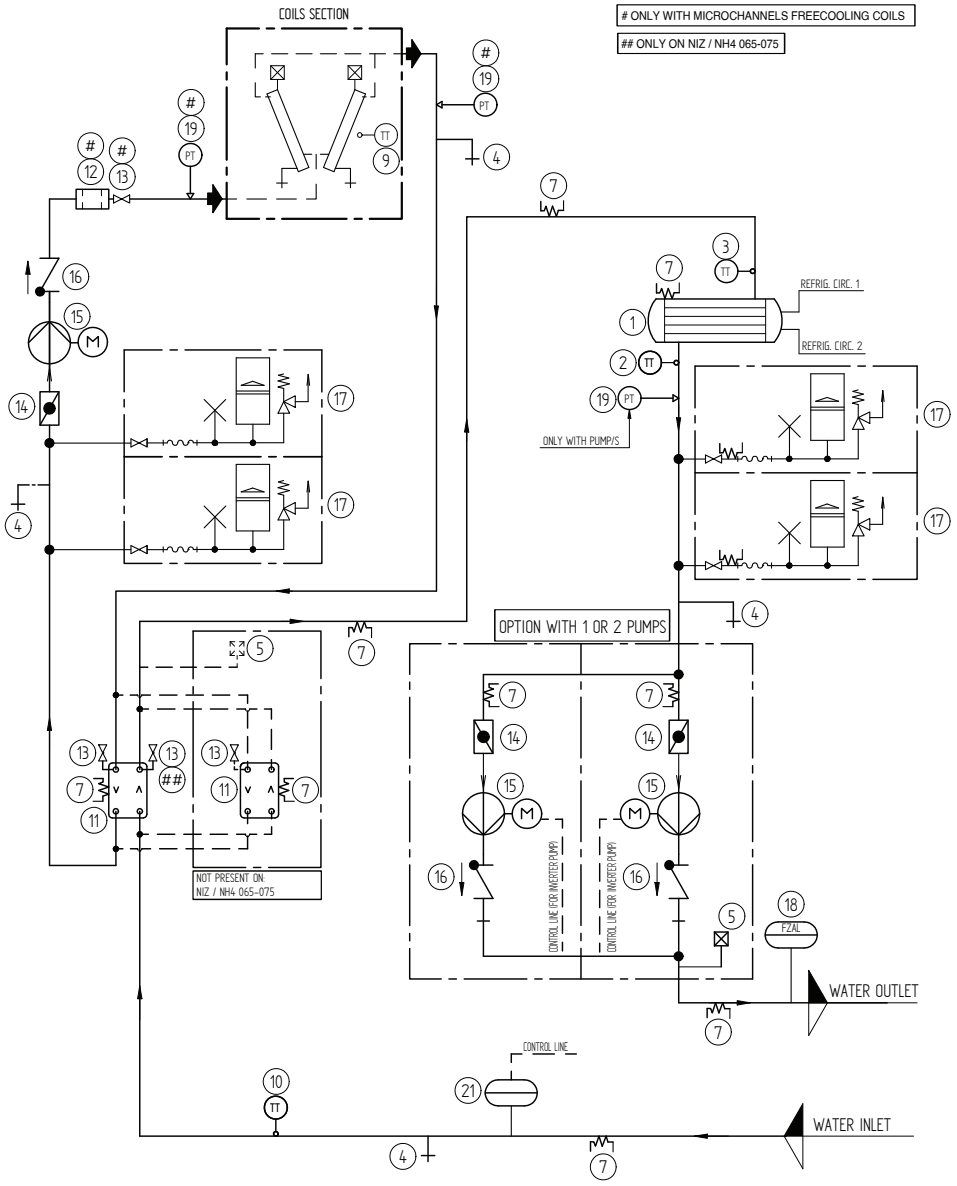
N°	Description
1	Evaporator
2	Evaporator water outlet sersor/antifreeze
3	Evaportator water inlet sensor
4	Discharge valve
5	Manual air valve
6	
7	Electrical heaters for exchanger/pipe (optional)
8	
9	
10	
11	
12	
13	
14	Butterfly valve
15	Pump
16	No return valve
17	Kit expasion vassel - safety valve - manual air valve - flex pipe - valve (std with pump/s)
18	Flow switch
19	Pressure trasducer
20	
21	Flow meter (std with electronic pumps, optional for others)

Annex II – Hydraulic Circuit



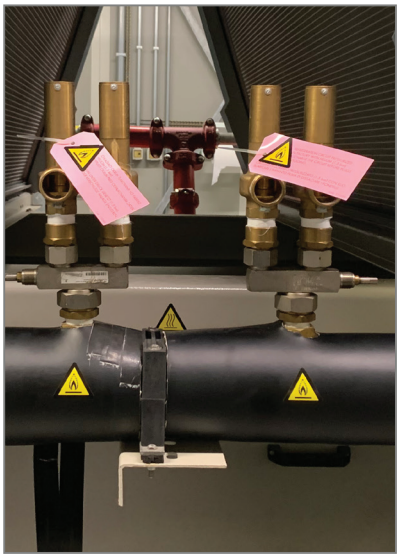
N°	Description
1	Evaporator
2	Evaporator water outlet sersor/antifreeze
3	Evaportator water inlet sensor
4	Discharge valve
5	Manual air valve
6	freecooling coil
7	
8	2 way valve
9	Air temperature sensor
10	Control freecooling thermostat sensor
11	
12	Water filter
13	Valve
14	Butterfly valve
15	Pump
16	No return valve
17	Kit expasion vassel - safety valve - manual air valve - flex pipe - valve (std with pump/s)
18	Flow switch
19	Pressure trasducer
20	Calibrate baffle
21	Flow meter (std with electronic pumps, optional for others)

Annex II – Hydraulic Circuit

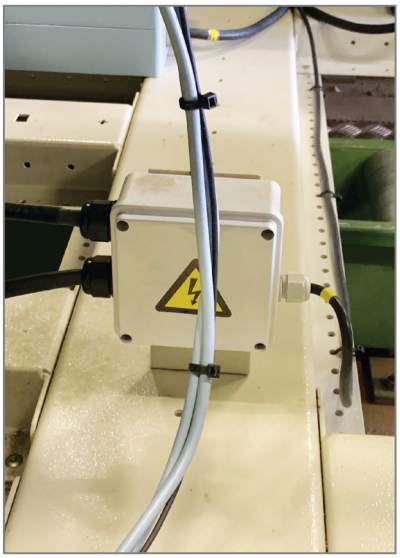


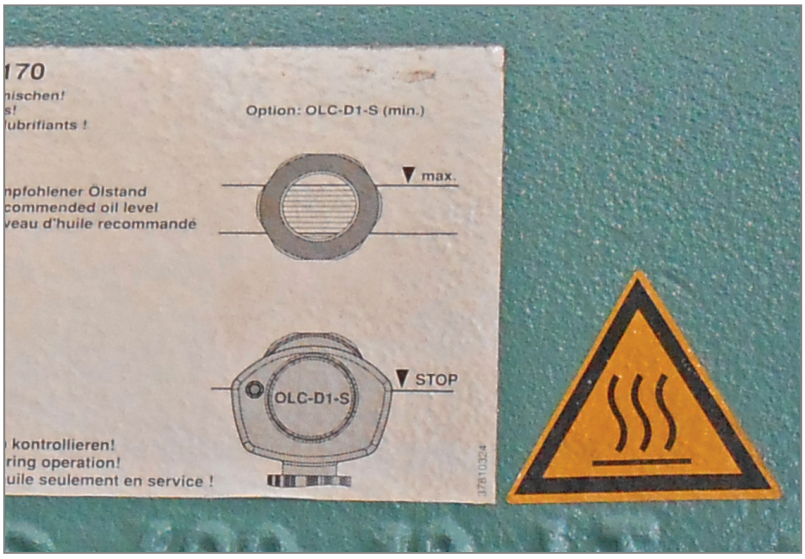
N°	Description
1	Evaporator
2	Evaporator water outlet sersor/antifreeze
3	Evaportator water inlet sensor
4	Discharge valve
5	Manual air valve
6	freecooling coil
7	Electrical heaters for exchanger/pipe (optional)
8	
9	Air temperature sensor
10	Control freecooling thermostat sensor
11	No glycol exchanger
12	Water filter
13	Valve
14	Butterfly valve
15	Pump
16	No return valve
17	Kit expasion vassel - safety valve - manual air valve - flex pipe - valve (std with pump/s)
18	Flow switch
19	Pressure trasducer
20	Calibrate baffle
21	Flow meter (std with electronic pumps, optional for others)

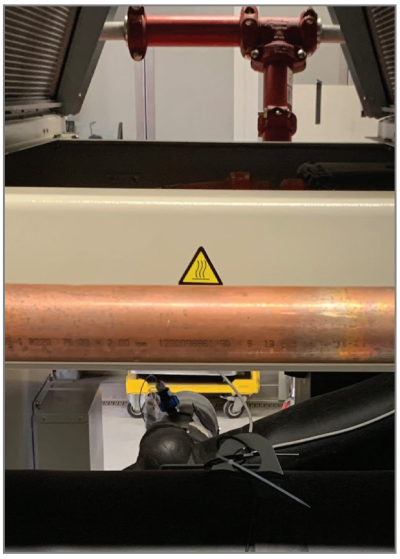
Annex III – Safety Labels



min. 1500 kg
Verdichter nur mit Traverse anheben!
Lift this compressor with spreader-bar only!
Soulever le compresseur seulement avec une traverse !







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2006/42/EC; 2014/30/EU; 2014/35/EU; 2014/68/EU; 2011/65/EU; EU/2015/863

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